ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. XI.

APPENDIX.

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1913
v. 11, pt. 1
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ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. XI.

APPENDIX.

ASIATIC PALMS-LEPIDOCARYEAE

By

Dr. ODOARDO BECCARI.

SUPPLEMENT TO PART I.

THE SPECIES OF CALAMUS.

WITH 83 PLATES.

CALCUTTA:
Printed at the Bengal Secretariat Press.
1913.

Published at the Bengal Secretariat Book Depôt,

Writers' Buildings, Calcutta.

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EDITORIAL NOTE.

Owing to unavoidable circumstances the original index issued with Volume XI of the Annals could neither be prepared nor revised in proof by the author of Volume XI or by the permanent editor of the Annals. As the index so issued contains many errors, and as in any case owing to the changes now made by the author in the supplement, even if accurate when issued it would no longer be so, the editor has compiled a single index to the species mentioned or described and plates contained in both Volume XI and its appendix. It is recommended that the index issued with Volume XI be replaced by the one now issued. Two copies of the revised and enlarged index are issued with the appendix to allow of a copy for Volume XI and for its appendix separately if desired.

SUPPLEMENT TO THE SPECIES OF CALAMUS.

PREFACE.

I HAD just completed the monograph of the genus *Calamus* published in Vol. XI of these Annals, when a large amount of new material was put into my hands, derived mainly from the botanical explorations undertaken in the Philippines by authority of the American Government under the direction of Mr. Elmer D. Merrill and also by the private exertions of Mr. A. D. E. Elmer and Mr. A. Loher.

Another important source of new species has been the collections of the Buitenzorg Herbarium, which were forwarded to me at Florence by the Director of that establishment: these contained valuable specimens collected many years ago by the late Mr. Teijsmann, during his numerous voyages in various parts of the Malayan Archipelago, and those collected by Dr. Hallier, the botanist of the recent Dutch explorations in the interior of Borneo.

I have also to thank the Directors of the botanical establishments of Kew, Paris, Berlin, Breslau and Singapore, for the loan of the novelties contained in the Herbaria under their charge.

As a result of these new acquisitions the total number of species of *Calamus*, which at the time of the publication of my monograph amounted to 201, is now raised to 256.

After a careful general revision of the entire genus, I have to make only the following alterations in the nomenclature already adopted in my monograph.

Calamus Delessertianus Becc., is to be eliminated as a species, as it turns out to be identical with *C. tenuis* Roxb.

Calamus Kunzeanus Becc., was founded upon some detached fruits, which after careful comparison have proved to be those of a *Pigafetta*, probably of *P. filaris* Becc. (Vide "Webbia" iii, p. 244.)

C. Harmandi Becc. I now hold to be the type of a distinct genus (*Zalaccella Harmandi* Becc. in "Webbia iii, p. 244.)

C. Martianus Becc. is a synonym of *C. penicillatus* Roxb., which name takes the precedence.

C. bubuensis Becc. is the male-plant of *C. brevispadix* Ridley, which name also takes the precedence.

The new additional species alter considerably the geographical data already given at p. 45 of this volume of the Annals, especially in regard to the floras of the Philippines, Borneo, the Malayan Peninsula and Indo-China, and accordingly I think it useful to give a new enumeration of the species inhabiting the above mentioned regions.

SIAM, COCHIN-CHINA, CHINA.

Calamus acanthophyllus; C. Balansæanus; C. Bonianus; C. Bousigonii; C. cambojensis; C. dioicus; C. dongnaiensis; C. Faberii; C. formosanus; C. Godefroyi; C. Henryanus; C. Kerrianus; C. oxycarpus; C. palustris; C. platyacanthus; C. rudentum; C. salicifolius; C. scutellaris; C. siamensis; C. tenuis; C. tetradactylus; C. thysanolepis; C. tonkinensis; C. viminalis.—sp. 24.

PHILLIPINES.

Calamus alconensis; C. Arugda; C. bicolor; C. Blancoi; C. Cumingianus; C. Diepenhorstii *var.* exulans; C. dimorphacanthus; C. dimorphacanthus *var.* montalbanicus; C. dimorphacanthus *var.* zambalensis; C. discolor; C. discolor *var.* negrosensis; C. Elmerianus; C. filispadix; C. Foxworthyi; C. grandifolius; C. Jenningsianus; C. manillensis; C. megaphyllus; C. melanorhynchus; C. Merrillii; C. Merrillii *var.* Merrittianus; C. Meyenianus; C. microcarpus; C. microsphærion; C. mindorensis; C. mitis; C. mollis; C. mollis *var.* major; C. mollis *var.* palawanicus; C. Moseleyanus; C. ornatus *var.* philippinensis; C. multinervis; C. ramulosus; C. Reyesianus; C. Samian; C. siphonospathus; C. siphonospathus *var.* sublevis; C. siphonospathus *var.* farinosus; C. siphonospathus *var.* oligolepis major; C. siphonospathus *var.* oligolepis minor; C. siphonospathus *var.* polylepis; C. siphonospathus *var.* batanensis; C. spinifolius; C. trispermus; C. Vidalianus; C. viridissimus. Sp. 34.

BORNEO.

Calamus acuminatus; C. aquatilis; C. bacularis; C. Blumei; C. brachystachys; C. calorhynchus; C. caesius; C. corrugatus; C. divaricatus; C. erioacanthus; C. ferrugineus; C. filiformis; C. flabellatus; C. Gibbsianus; C. gonospermus; C. Hewittianus; C. hispidulus; C. hypertrichosus; C. impar; C. Jaherianus; C. javensis; C. javensis *var.* tetrastichus; C. javensis *var.* tetrastichus mollispinus; C. javensis *var.* sublævis; C. javensis *var.* acicularis; C. marginatus; C. mattanensis; C. mattanensis *var.* Sabut; C. mucronatus; C. muricatus; C. myriacanthus; C. nematospadix; C. optimus; C. ornatus *var.* mitis; C. paspalanthus; C. pilosellus; C. poensis; C. pogonacanthus; C. pseudo-Ulur; C. retrophyllus; C. rhomboideus; C. rhytidomus; C. ruvidus; C. sabensis; C. sarawakensis; C. scabrifolius; C. schistoacanthus; C. Scipionum; C. Semoi; C. sphæruliferus; C. spinulinervis; C. subinermis; C. Tapa; C. trachycoleus; C. zonatus.—Sp. 50.

MALAYAN PENINSULA.

Calamus aquatilis; C. axillaris; C. brevispadix; C. caesius; C. castaneus; C. conirostris; C. Curtisii; C. densiflorus; C. Diepenhorstii; C. Diepenhorstii *var.* singaporensis; C. distichus; C. dumetorum; C. exilis; C. filipendulus; C. giganteus; C. Griffithianus; C. insignis; C. javensis; C. javensis *var.* peninsularis; C. javensis *var.* peninsularis purpuraceus; C. javensis *var.* peninsularis pinangianus; C. javensis *var.* tenuissimus; C. javensis *var.* polyphyllus; C. javensis *var.* intermedius; C. lanatus; C. laxiflorus; C. laxissimus; C. Lobbianus; C. longispathus; C. luridus; C. multirameus; C. neglectus; C. ornatus *var.* horridus; C. Oxleyanus; C. pallidulus; C. palustris; C. paspalanthus *var.* peninsularis; C. penicillatus; C. perakensis; C. pulaiensis; C. radulosus; C. ramosissimus; C. Ridleyanus; C. rugosus; C. scabridulus; C. Scipionum; C. simplex; C. spathulatus; C. tomentosus; C. viminalis; C. viridissimus.—Species 44.

To the species of CELEBES add:—Calamus pseudo-mollis; C. Koordersianus; C. ornatus *var.* celebicus.

To the species of NEW-GUINEA add:—Calamus pilosissimus; C. wari-warensis; C. Schlechterianus; C. Moszkowskianus.

To the species of SUMATRA add:—Calamus benkulensis; C. palembanicus; C. Ulur.

To the species of TROPICAL AFRICA add:—Calamus Laurentii.

One Calamus (C. timorensis) has been found in TIMOR and one in the KEY ISLANDS (C. keyensis).

ADDENDA TO THE EXCLUDED OR UNRECOGNISABLE SPECIES.

Calamus apicularis Miq. Prodr. Fl. Sum. 595. It is said by its author to be allied to *C. subangulatus*, but I have seen unable to discover a description of it.

„ *Cabrae* DeWilld. et Dar.—Eremospatha Hookeri *Wend.*

„ *Gracillimus* Hort. Quid?

„ *Harmandi* Becc. in Rec. Bot. Surv. Ind. ii, 216—Zalaccella Harmandi *Becc.*

„ *Kunzeanus* Becc. in Ann. Roy. Bot. Gard. Calcutta, xi, 490—Pigafetta filaris *Becc.*

„ *laevigatus* Mart. Hist. Nat. Palm. iii, 399—Ceratolobus lævigatus *Becc.*

„ *lanatus* Hort. Quid?

„ *Moutdnus* Hort. Quid?

Calamus niger (non Willd.) J. Braun and K. Schum. in Mitth. Deutsch Schutzgeb. ii (1889) 147 ex. Wright in Fl. Trop. Afri. viii, (1902), 109, (excl. syn. omn.) from the Cameroons in Upper Guinea. I have not seen the type specimen of this Palm, but as the inflorescence is described as being produced near the apex of the stem, as nodding, paniculately branched, and borne on a long peduncle, and as the leaves are said to have a cirriferous rachis furnished with uncinate spines, the species certainly cannot be a *Calamus* or a *Dæmonorops*, but it possibly corresponds to *Oncocalamus Manni* Drude.

C. robustus Hort. Quid?

„ *subangulatus* Miq. Prodr. Fl. Sum. 257, 595—Ceratolobus subangulatus *Becc.*

„ *turbinatus* Ridley, Mat. Fl. Mal. Pen. ii, 212—Plectocomiopsis Wrayi *Becc.*

In regard to the length of the stem attained by certain species of Calamus Sir W. T. Thiselton-Dyer kindly points out to me that in the Museum No. II at Kew there are two *Calamus* stems coiled round the gallery. One goes round four times and is 369 ft. or 110 m. 70 cms. long; the other is 160 ft. or 48 m. (Guide to Museum Kew, p. 36).

About the origin of these specimens I asked the present Director of the Kew Gardens, Sir David Prain, who informs me that he believes that the shorter

specimen (160 ft. long) was originally in the Museum of the East India Company, the botanical contents of which came to Kew when the possessions of that Company were taken over by the Government; this specimen may be from India, but it is just as likely to have come from the Malayan Peninsula, or from Sumatra or from Java. The longer one (369 ft.) clearly came direct to Kew from Mr. W. Ferguson of Colombo, and there is no doubt that this specimen is a Ceylon one. What particular species these specimens represent it is very difficult to say.

Prof. H. Baillon in the "Monographie des Palmiers" ["Histoire des Plantes" Vol. XIII (1895) p. 326] revived the generic name *Rotang*, used by Linnaeus in the "Flora Zeylanica (1747) 209, in substitution for *Calamus*, but *Rotang* Baill. includes both genera *Calamus* and *Daemonorops*.

The following are the species of *Calamus* mentioned by Baillon under the name of *Rotang* at pp. 299, 300.

Rotang Linnaei *Baill.* ...	*Calamus Rotang* Linn.
,, verus *Baill.* ...	*Calamus verus* Lour. [This has been supposed by me to be a species of *Dæmonorops* (See Vol. XI, pp. 38-39). The name is not inserted in the index.]
,, latispinus *Baill.* ...	Rosenth. Syn. pl. diaphor, 151. *C. latispinus* Hort.; an unrecognised and excluded species.
,, rudentum *Baill.* ...	*Calamus rudentum* Lour.
,, Royleanus *Baill.* ...	*Calamus tenuis* Roxb.
,, petræus *Baill.* ...	*Calamus petræus* Lour. (a doubtful species).
,, equestris *Baill.* ...	*Calamus equestris* Willd.
,, rhomboideus *Baill.* ...	*Calamus rhomboideus* Bl.
,, viminalis *Baill.* ...	*Calamus viminalis* Willd.
,, Scipionum *Baill.* ...	*Calamus Scipionum* Lour.
,, heteroideus *Baill.* ...	*Calamus heteroideus* Bl.
,, ornatus *Baill.* ...	*Calamus ornatus* Bl.
,, spectabilis *Baill.* ...	*Calamus spectabilis* Bl.
,, Manan *Baill* ...	*Calamus Manan* Miq.
,, Blancoi *Baill.* ...	*Calamus Blancoi* Kunth.
,, albus *Baill.* ...	*Calamus albus* Pers.
,, graminosus *Baill.* ...	*Calamus graminosus* Bl. (a doubtful species).
,, cæsius *Baill.* ...	*Calamus caesius* Bl.
,, melanoma *Baill.* ...	*Calamus melanoloma* Bl.
,, pisicarpus *Baill.* ...	*Calamus pisicarpus* Bl.
,, asperrimus *Baill.* ...	*Calamus asperrimus* Bl.
,, Cawa *Baill.* ...	*Calamus Cawa* Bl.
,, barbatus *Baill.* ...	*Calamus barbatus* Zipp.
,, ciliaris *Baill.* l. c. p. 259 Fig. 205, 206, 207, 208	*Calamus ciliaris* Bl.

The following are species of *Daemonorops*.

Rotang	micracanthus *Baill.*	...	*Daemonorops micracanthus* (Griff.) Becc.
,,	crinitus *Baill.*	...	*Daemonorops crinitus* Bl.
,,	scandens *Baill.*	...	This is said to correspond to *Daemonorops scandens* Bl. and is quoted Rosenth. Syn. pl. diaphor. 1093. I do not know a *Daemonorops* of that name.
,,	longipes *Baill.*	...	*Daemonorops longipes* Mart.
,,	periacanthus *Baill.*	...	*Daemonorops periacanthus* Miq.
,,	palembanicus *Baill.*	...	*Daemonorops palembanicus* Bl.
,,	adscendens *Baill.*	...	This is said to be *Daemonorops ascendens* Bl. (Ratan. pella). I do not know a *Daemonorops* of that name. Probably it corresponds to *D. accedens* Bl.
,,	maximus *Baill.*	...	Probably corresponds to *Plectocomia elongata* Bl.

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SUPPLEMENT TO THE SPECIES

OF

CALAMUS.

4. CALAMUS DONGNAIENSIS Pierre. Add:—Becc. in Webbia di U. Martelli, iii, 241, and in Bull. Mus. Hist. Nat. (1911), 159.

4a. CALAMUS ACANTHOPHYLLUS Becc. in Webbia di U. Martelli, iii, p. 229, and in Bull. Mus. Hist. Nat. (1911), 159.

DESCRIPTION.—Apparently stemless and bushy, producing shoots about as thick as a finger. *Leaf-sheaths* non-flagelliferous, split and open on the ventral side, 12–15 cm. long, with a thick back and thinly coriaceous edges, finely striate longitudinally, fugaciously and sparingly rusty–furfuraceous, more or less armed with very slender, straight, horizontal, acicular spines, which arise from a bulbous base and are 5–10 mm. long. *Ocrea* liguliform, rather elongate, at first furfuraceous, later glabrous, dry and deciduous. *Leaves* erect, rigid, 50–80 cm. long on the whole, the petiolar part alone 15–30 cm. long, subplano-convex in its lower part, subterete and 4–5 mm. in diameter higher up, more or less armed with small, scattered straight, light-coloured spines, which are often deflexed, especially on the back; the rachis has on the upper surface the salient angle acute and frequently more or less prickly, while on the lower is armed irregularly, with solitary, scattered, more or less hooked prickles; leaflets not numerous, 12–14 on each side, inequidistant, at times conspicuously yet not distinctly grouped, except a few (5–8) at the upper end, which are very approximate and radiate-digitate—the two of the terminal pair being connate to about the middle or somewhat less—, thickly papyraceous, very rigid, dull, almost equally green on both surfaces, linear, very narrow, plicate at the base, very minutely dotted, especially on the lower surface, with numerous, very small, linear, hair-like scales; the mesials are 15–25 cm. long, 6–10 mm. broad, acute or acuminate to a subpungent tip; the upper are shorter, and those of the apex only 7–10 cm. long, less acuminate and frequently obtuse or shortly bidentate; all are more or less distinctly 3-costulate and usually the mid-costa alone, but at times two, or also all three, bear some erect, conspicuous, rigid, acicular, straight, light-coloured spines, 3–5 mm. long; the margins are armed every 5–10 mm. with similar spreading spines; more rarely the spines on the nerves and on the margins are scanty and small; transverse veinlets rather numerous and sharp. *Spadices*, male and female, similar, very simple, erect, about as long as the leaves, non-flagelliferous; they terminate in an inconspicuous apiculum, spring laterally from near the apex of the leaf-sheaths, and have the base connate and decurrent along the entire length of the leaf-sheaths on which the origin of the spadices is marked by a broad smooth ridge. The spadices (male and female) consist of a small panicle, 10–20 cm. long, composed of only 4–8 alternate, more or less remote spikelets, borne at the end of a long, rigid, straight, terete or slightly flattened, 3–5 mm. thick, peduncular part, which is very strictly sheathed by several

tubular primary spathes; the lowest of these is more or less flattened and is longer than the others, which are terete and only slightly enlarged above, obliquely truncate at the mouth and shortly produced into a triangular point; they are frequently almost smooth or at times armed with small scattered hooked prickles; the spathes between the spikelets are usual 2–3 cm. or at times 4–5 cm. long. *Spikelets* erecto-patent, inserted above the mouth of their respective spathes; male and female similar, rigid, subterete in their axial part, 2–6 cm., or more rarely 8–9 cm. long; spathels shortly infundibuliform, produced at one side into a triangular, erect, acute point, usually very minutely scabrid-granulose or else smooth, yet strongly striately veined. *Male spiketets* usually carry distichally 8–10 flowers, rarely more, on each side, or fewer in the uppermost spikelets, while the lowest have occasionally one or two branches near their base; involucre inserted laterally at the base of the spathel above its own, cupular, more or less acutely 2-toothed on the side next to the axis and frequently with a distinct axillary callus. *Male flowers* narrowly ovoid, acute, 4–5 mm. long; the calyx cyathiform, strongly striately-veined, parted down to the middle into 3 deltoid, acute teeth; the corolla twice as long as the calyx. *Female spikelets,* as already stated, very similar to the male ones; involucrophorum concave, laterally attached to the base of the spathel above its own; involucre immersed in the involucrophorum and at a level with it, cupular, often not very regular; areola of the neuter flower conspicuous, callous, lunate. *Female flowers* ovoid, about 3 mm. long; calyx deeply 3-lobed; corolla not quite twice as long as the calyx. *Fruiting perianth* shortly pedicelliform; the calyx depressed, ventricose in its lower part and with a flat base. *Neuter flowers* apparently very similar to the fertile ones. *Fruit* ovoid or slightly obovoid, slightly tapered towards the base, and rather suddenly at the apex into a small acute beak, 8–9 mm. broad, 12–15 mm. long (including beak and perianth); scales arranged in 15 longitudinal series, very superficially, at times obsoletely, grooved along the centre, straw coloured, very distinctly yet narrowly edged with dark brown, the margins scarious, erose-toothed, the apex acute. *Seed* elliptical, rounded at both ends, slightly flattened, 7 mm. long, 5 mm. broad, 4 mm. thick, even–surfaced with the chalazal fovea round and rather deep in the centre of the raphal side; albumen equable, embryo basal.

HABITAT.—Cochin-China: Rivière d'Ubon. Expédition du Me-kong (1866–1868); collected by *Thorel* (Paris Herbarium). Also in Laos (*Massie* in Paris Herbarium).

OBSERVATIONS.—A very anomalous species, which may however be grouped with *C. erectus* and *C. dongnaiensis.* As far as I can judge from the several specimens I have seen, it is a small non-climbing plant; it has no flagella at the leaf-sheaths, nor at the end of the spadices, and has non-cirriferous leaves; the spadices are extraordinarily simple, male and female very similar.

It varies in the spinescence of the leaflets which in some specimens are almost smooth on the mid-costa, and have the margins sparingly and very remotely spinulous, whereas more frequently these are spinous beyond all but a very few species.

SUPPL. PLATE 1.—Calamus acanthophyllus *Becc.* Male spadix with its leaf in the middle of the plate; detached male spadix; fruiting spadix and its leaf, which is spinous also on the mid-costa. From Thorel's specimens in Paris Herbarium.

6. Calamus Thwaitesii *var.* canaranus Becc.

C. Thwaitesii Becc.; Cook, Fl. Bomb. ii, 807.

To the localities add—South Kanara (Herb. Rep. Econ. Prod. of India). Vern. name. "Jeddubetta." Common in the evergreen forests at the foot of the Nilkund Ghát of N. Kanara (*Talbot* ex Cook l. c.)

10. Calamus castaneus Griff. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 211 (partly). Ridley unites to this *C. Griffithianus* Mart., and gives several localities not mentioned by me. He attributes to it the native name "Atap Chuchur," and says that the leaves are used for thatching. We are left uncertain, however, to which of the two species the localities, the native name, and the uses belong.

13. Calamus deerratus Mann et Wendl.

In the Flora of Tropical Africa (viii. 109) *Johnson's* No. 242 from the Akim district, which is the type of *C. akimensis* Becc., and *Cummins's* No. 128 from the Ashanti country (Cummins in Kew Bulletin, 1898, 80),—which I have not seen and may possibly belong also to *C. akimensis*—are referred to *C. Deerratus.*

C. deerratus seems a rather common plant especially in the littoral regions of Old Calabar, Kamerun, and Spanish Guinea. I have seen good male specimens of it gathered (29th January 1909) by *C. Ledermann* at Tibati in Kamerun (No. 2428 in Herb. Berol.), and others (♂ and ♀) by Günter Tessmann at Bebad in the region of Campo, near the frontier between Kamerun and Spanish Guinea (No. 1093 in Herb. Berol.). Of these last the sheathed stem is 3 cm. in diameter; the leaf sheaths are densely armed with laminate, almost black, horizontal spines, 10–15 mm. long, but at times less. The ocrea is 9 cm. long, very densely armed on the outer side with laminate, spines, similar to those of the vagina, but larger, and up to 2 cm. in length, very approximate, and obliquely inserted. A female spadix bears 5 partial inflorescences, is 2·5 m. long, and ends in a long clawed flagellum. The leaves are 1·2 m. long, inclusive of a petiolar part 20 cm. long. The leaflets are numerous and almost equidistant.

Other specimens from Akoafim in Kamerun (Herb. Berol.) have sheathed stems 2–5 cm. in diameter; are strongly armed with spines, at times quite 25 mm. long; the ocrea is 14 cm., and the petioles 15–20 cm. long; the leaflets are more inequidistant than in the other specimens and at times are even 8 cm. apart; otherwise as usual. On this account these last specimens are barely distinguishable from the type of *C. Laurentii*, which however seems to me to be only a form of *C. deerratus.*

14. Calamus Barterii Becc.

The type specimen of this species is *Barter's* No. 110 from Onitsa, Lower Nigeria; but in the Flora of Tropical Africa (viii, 109) are added the following from Sierra Leone:—Musaia in marshy ground, *Scott-Elliot* No. 5121; Kambea, *Scott-Elliot* No. 4738, and *Scott-Elliott* No. 4460; the latter in the Berlin Herbarium

bears the locality of Falaba and is the type of *C. falabensis* Becc. Probably to this last species belong also *Scott-Elliot*'s Nos. 4738 and 5121.

20. CALAMUS SCHWEINFURTHII Becc.

Good specimens of this plant, with spadices bearing male flowers and fruits, have been collected by Dr. Milbraed, in the district of Beni, in the region of Ruwenzori, in January 1908 (No. 2193 in Herb. Berol.). The sheathed stem of the adult plant is 15-18 mm. in diameter. The leafsheaths are armed with scattered, small, black, laminar spines which have a bulbous light-coloured base. The *leaves* of the full grown plant are 85 cm. long on the whole, of which 12–15 cm. are taken by the petiolar part; this is flat on the upper and convex on the lower surface, where it is armed along the centre with elongate claws; the margins are acute and armed with spines, horizontal or pointing in different ways. *Leaflets* about 30 on each side, slightly inequidistant, 2–5 cm. apart on each side in the lower part of the rachis, closer (1–2 cm. apart) and almost equidistant from the middle upwards; those near the base are 25–30 cm. long, 10–12 mm. broad; those of the middle 20–25 cm. long, 15–18 broad, the upper ones gradually and slightly shorter, otherwise as already described. *Male spadices* very similar to those of *C. deerratus*, simply decompound, flagelliform, bearing very few (3 in one specimen) partial inflorescences that carry several strongly arched spikelets on each side, and terminate in a tail-like spikelet longer than the others. The spikelets are usually 5–6 cm. long, and have 10–20 flowers on each side; spathels brown, broadly and asymmetrically infundibuliform, produced at one side into a triangular acute point; involucre dimidiately cupular or of the shape of a swallow's nest, obliquely truncate, acutely two-keeled and with the margin lunately excavate on the axial side. The full grown unexpanded *male flowers* are ovoid-oblong, very obsoletely trigonous, not or very slightly curved, 6–7 mm. long, 3 mm. broad; the calyx is parted down to the middle into 3 acute lobes; the corolla is not quite twice as long as the calyx; its segments are lanceolate-elliptical, acute. Filaments of the stamens subulate; anthers lanceolate apiculate, with the cells deeply disjoint in their basal part. A partial inflorescence loaded with fruits is 35 cm. long and has 12–13 spikelets on each side. The *fruits* are exactly as already described, 16–19 mm. long, 12–15 mm. broad (quite mature). *Seed* 10 mm. long, 8·5–9 mm. broad.

After a careful study of the good specimens of *C. Schweinfurthii* collected by Dr. Milbraed I feel inclined to consider this palm as only a geographical form, or, at most, as a sub-species of *C. deerratus*. The only appreciable diagnostic character I have been able to discover between the two is in the fruit, which in *C. Schweinfurthii* has fewer, and consequently larger scales, with the margins less distinctly fringed-ciliate than in the other. The male spadices of *C. Schweinfurthii*, which were hitherto unknown, offer but slight differences, the flowers being only slightly larger and possibly less curved than those of *C. deerratus*. The petiole of the leaves of *C. Schweinfurthii* varies in length according to the age of the plant, being short in those of the full grown and longer in those of the young plant as were those collected by Schweinfurth, and already described by me.

The great affinity, or the perhaps almost specifical identity, of *C. Schweinfurthii* with *C. deerratus* is a fact worthy of notice on account of two other palms growing in the same region, *Ancistrophyllum opacum* and *Eremospatha Cabrae*, which, almost unaltered in their specific characters, enjoy an extraordinarily large geographical range across central equatorial Africa, from the lake regions to the Gulf of Guinea.

20 a. CALAMUS LAURENTII De Wild., Etudes sur la Flore du Bas et Moyen Congo, ii, (1904), 97, pl. xxvii, xxviii, and Mission Laurent, 24.

DESCRIPTION.—Scandent, rather slender. *Sheathed* stem 18–20 mm. in diameter. *Leafsheaths* slightly gibbous above, rather thickly coriaceous, more or less covered with a tobacco-coloured furfuraceous scurf, and very densely armed with irregularly and very closely, interruptedly seriate, deflexed spines, which are thinly laminar, very acuminate, 1–2 cm. long, glossy and almost black, with a lighter and slightly swollen base; near the mouth, on the ventral side, the spines are more numerous, longer than elsewhere and ascendent. *Ocrea* very conspicuous, elongate, 12 cm. long (in one specimen), densely covered on the outer side with erect spines similar to those of the sheaths but a little longer and less rigid; at first the ocrea is liguliform and entire, but later is divided down along the middle in two almost linear parts, one on each side of the petiole. Leaf-sheath flagella springing from very near the mouth of the sheaths, very long and slender and armed with very small usually scattered claws. *Leaves* rather large, the two seen by me 1·40 m. long on the whole, not cirriferous; petiole about 25 cm. long, 8–10 mm. broad, flat on the upper surface, armed rather powerfully at the margins with several laminar spines similar to those of the sheaths but longer; near the mouth the spines are denser and longer than elsewhere (4–6 cm. long); underneath the petiole is rounded and armed with some straight needlelike spines which along the middle are at first straight and gradually pass into claws; the rachis on the lower surface is convex and armed with a single series of rather long-tipped solitary claws along the middle and occasionally with smaller claws at the sides near the insertion of the leaflets; *Leaflets* rather numerous, about 30 on each side, all on one plane (not pointing in different directions) very inequidistant, especially in the lower part of the rachis, where they are usually approximate in groups of 4–5 on each side with vacant spaces 8–10 cm. long; in each group they are 1–2 cm. apart; towards the summit of the leaf the leaflets are less irregularly set and usually 2–3 cm. apart, rarely more; the leaflets are rigidulously papyraceous, linear-lanceolate or narrowly lanceolate-ensiform, tapering towards the base from below the middle and thence gradually acuminate above into a subulate, very slender, bristly spinulous apex, dull and subconcolorous on both surfaces; the mid-costa is acute and spinulous only near the apex above, and is accompanied on each side by 2–3 secondary nerves, of which one is conspicuously spinulous throughout and is a little stronger than the others, but not so much so as to render the upper surface distinctly three-costulate; the under surface is not dotted, has the mid-costa bristly-spinulous near the apex and one nerve on each side of it also spinulous throughout; margins slightly thickened by a weak secondary nerve, closely and rather spreadingly spinulous-serrulate; transverse veinlets slender, much interrupted; the largest leaflets, those of the lower third of the entire leaf are 45–50 cm. long. and 18–20 mm.

broad, those near the base are narrower but hardly shorter, towards the end are gradually shorter, and like the others acuminate and not or very indistinctly indented below the apex; those of the terminal pair are the smallest, very narrow, quite free or very shortly united by their bases. *Male spadix* flagelliform, very slender and long (up to 4 m. in one specimen), simply decompound, with six gradually diminishing, very remote partial inflorescences, and lengthened out into a very slender, very minutely clawed, terminal flagellum; the lowest spathe is elongate, closely sheathing, somewhat flattened and rather acutely two-edged (especially near its base) and is armed on the outer surface and on the margins with very small claws, is obliquely truncate at the apex and produced into a triangular acute point; the upper spathes are very elongate, split along one side near the apex, which is lanceolate, membranous and marcescent, acute or sub-3-dentate; otherwise the primary spathes are very closely sheathing and cylindraceous in their upper part, and gradually pass lower down into a more slender axial part which is acutely angular on the inner side in its first portion and convex and strongly armed with rather robust 3-nate claws on the outer side; partial inflorescences elongate, attached inside their respective spathes with a pedicellar part about 2 cm. long; the lowest partial inflorescence is 40 cm. long and bears distichally 15-16 spikelets on each side; the others are gradually shorter and have fewer spikelets; secondary spathes smooth, tubular-infundibuliform, obliquely truncate, deciduously ciliate at the mouth, often split along the inner side, produced externally into a triangular acute or acuminate point; spikelets not pedicellate but inserted inside the mouth of their respective spathes, strongly arched, vermicular, somewhat flattened, of a brown colour: the lower, largest, are up to 12—14 cm. long. and have 25—30 flowers on each side; the upper are gradually shorter and with fewer flowers; spathels very approximate, finely striately veined, glabrescent or fugaciously slightly furfuraceous, broadly infundibuliform, produced at one side into a short acute triangular point; involucre obliquely cupular, tapering towards the base and attached at the base of its own spathel, very acutely two-keeled and deeply bidentate (not lunately excavate) on the side next to the axis. *Male flowers* narrow, subfalcate, acuminate, 8 mm. long; the calyx tubular, finely striately veined, rather deeply divided into 3 acute lobes; the corolla about twice as long as the calyx, parted down almost to the base into 3 very narrow, very acuminate, falcate segments. *Female spadix*. . . .

HABITAT.—On the banks of rivers in Belgian Lower Congo, collected in the neighbourhood of Eala by *Marcel Laurent* in 1903 (No. 126 in the Brussels Herbarium). Native name "Lokolokoto."

OBSERVATIONS.—It is probably only a local form of *C. deerratus*, from which it differs in the leaf-sheaths more densely armed with laminar, black, deflexed, closely and interruptedly seriate spines; in the longer, liguliform ocrea (later split into 2 parts), very densely armed with elongate, laminar, black, ascendant spines; in the leaflets more strongly spinulous-serrulate on the margins, rather numerous, very inequidistant, and on the lower part of the leaf approximate in separate groups with long vacant spaces interposed; in the involucre of the male flowers being more obliquely cupular, bilobed (not lunately excavate) on the posticous side; finally in the male flowers narrowly falcate, 8 mm. long, acuminate, with the corolla twice as long as the calyx.

SUPPL. PLATE 2.—Calamus Laurentii *De Wild.* Portion of the sheathed stem with the bases of one leaf and one spadix; lower portion of a leaf; terminal part of a leaf; upper portion of a male spadix. From the type, Laurent's No. 126 in the Herbarium at Brussels.

24. CALAMUS RUVIDUS Becc.

It has been found again in Sarawak by *Hewitt*, according to a specimen in the Herbarium at Kew, represented by an entire leaf and a complete male spadix. The *leaf* has five sides leaflets in all and one apical deeply parted, and is on the whole 60 cm. long. The leaflets are as in the type, but slightly longer and more narrow (35–40 cm. long and 3 cm. broad). The petiolar part is 12 cm. long, strongly depressed, flat above, slightly convex below, 5 mm. broad and only 2 mm. thick, has the margins very sharp and is strongly and irregularly armed on the lower surface with claws of which some are solitary and others more or less confluent or digitate; the rachis has a sharp salient angle above and is irregularly armed with rather strong claws below. The leaf-sheath, from what can be judged by a small portion, is rather strongly spinous and has at the mouth a distinct glabrous, dry, ligular part. The sheathed stem is apparently more than 2 cm. in diameter. The *male spadix* forms a nodding panicle three times branched, about 80 cm. long, and is divided into several approximate, gradually diminishing, partial inflorescences and ends in a filiform, finely aculeolate, rudimentary flagellum. The lowest spathe is flattened, sharply two-edged and closely sheathing in its lower part, somewhat broadened above and lacerate at its upper end,—which otherwise would be acuminate, and is covered with small claws on its back. The other spathes are also tubular in their lower part, somewhat enlarged, and are split above and prickly on the back and have the apex acuminate and more or less marcescent. Partial inflorescences arched, rather dense, gradually smaller, the lower ones about 30 cm. long, with in their lower part 4–5 gradually diminishing compound spikelets and some simple spikelets above; secondary and tertiary spathes scabrid-papillose, tubular at their bases, suddenly broadening into a short infundibular limb, which is ciliolate at the mouth and has the point subulate and more or less marcescent. Spikelets arched, small, the lowest and largest 2–2·5 cm. long, their axial part slender, and flowers regularly bifarious; spathels scabridulous–papillose, concave–subbracteiform or very briefly infundibuliform, ciliolate and prolonged into a subulate spreading point; involucre cupular, subtrigonous with the posticous points acute. *Male flowers* small, very narrowly ovoid, acute, 3 mm. long; the calyx tubular with 3 deltoid acute teeth, strongly striately veined; the corolla dull outside, longer by a half than the calyx.

Hewitt assigns to *C. ruvidus* the Malay name "Rotan buloh."

24*a*. CALAMUS RHYTIDOMUS Becc. n. sp.

C. ruvidus Becc. in Rec. Bot. Surv. Ind. ii, 202 (as to description of the leaf-sheaths only).

DESCRIPTION.—Scandent slender. *Sheathed-stem* 12–17 mm. in diameter. *Leaf-sheaths* not or slightly gibbous above, very obliquely truncate at the mouth, distinctly striate longitudinally, armed rather densely with scattered, very short (1–5 mm. long), triangular, ascendant spines, which above have a swollen base and are flat

underneath; moreover between the spines are several transverse, interrupted, slightly raised, slender but sharp ridges, which are minutely scabrid on their crests. *Ocrea* membranous, later dry, brown and falling to pieces. *Leaves* 60–70 cm. long on the whole, with only 3–5 irregularly alternate leaflets on each side of the rachis and two at the apex, which latter are united in their lower part; petiole short, 5–7 cm. long, 4–5 mm. broad, flat and more or less prickly on the upper and convex on the lower surface, armed on the edges with short, straight spines, and along the centre on the back, with rather robust claws; the rachis has an acute smooth salient angle on the upper surface and is rather powerfully armed along the centre and at the sides with solitary, scattered, brown and black-tipped claws on the lower surface; leaflets rigid-papyraceous, acquiring a tobacco-brown colour in drying, concolorous, almost glossy and quite hairless and spineless on both surfaces; transverse veinlets extremely numerous and continuous, very fine and sharp on both surfaces; side leaflets lanceolate, oblanceolate or elliptical lanceolate, sharply 5-7-costulate, 25–32 cm. long, 3·5–5·5 mm. broad, usually broadest above their middle, more gradually tapering towards the base than towards the apex, the latter triangular, acute and quite smooth as are also the margins; the two apical leaflets are united in their lower third or up to the middle and are somewhat shorter and broader than the side leaflets. *Male spadix* . . . . . *Female spadix* very elongate, flagelliform, 2 mm. long in one specimen, very lax, with about 8 remote gradually diminishing partial inflorescences (the uppermost reduced to a single spikelet) that terminate in a very slender, very minutely clawed appendage, about 10 cm. long; primary spathes very elongate, tubular, strictly sheathing, armed with very small tuberculiform prickles, obliquely truncate at the mouth and terminating in a lanceolate acute point; the lowest spathe is 25 cm. long, somewhat flattened at its base and terete above where it is 6 mm. in diameter; the upper spathes are longer and gradually more slender and little by little narrow into the axial part, which is flat with sharp edges on the inner side and is convex externally where armed with several, solitary, blackish claws; partial inflorescences inserted at the mouths of their respective spathes with a distinct axillary callus, elongate and flaccid; the lower are 50–60 cm. long and have 12–15 spikelets on each side; the others are gradually smaller and have fewer spikelets; secondary spathes tubular, elongate, 15–25 mm. long, slightly enlarged, but strictly sheathing above where they are 2–3 mm. in diameter, scabridulous, obliquely truncate, entire and ciliolate at the mouth, produced at one side into a triangular acute point; spikelets inserted just at the mouth of their respective spathes, distinctly callous and with a transverse rima at their axillas, strongly deflexed, their axis vermicular and rather slender; the lower spikelets are 5–6 cm. long and have 18–20 distichous approximate flowers on each side; the upper and those of the partial inflorescences near the end of the spadix are somewhat smaller; spathels very densely scabrid-papillose, shortly infundibuliform, entire, truncate and ciliolate at the mouth, very slightly produced at one side into a short triangular obtuse or subacute point; involucrophorum shallowly cupular, attached almost outside its own spathel at the base of the one above; involucre cupular, orbicular, slightly protruding beyond the involucrophorum, and with an irregular and crenulate edge; areola of the neuter flower conspicuous, flattish, callous, almost orbicular, sharply edged, at times slightly smaller than the involucre. *Fruiting perianth* explanate, the calyx smooth, broadly three-lobed; the corolla twice as long as the calyx, its lobes

lanceolate, acute, smooth outside. ***Fruit*** very small, spherical (8–9 mm. in diameter), shortly beaked, the beak three-lobed; scales convex, not or very faintly grooved along the centre, dull, of a hazel-nut colour, darker towards the obtuse point, their margins finely erose-ciliolate. ***Seed*** globular, boldly tubercled or lobulate, subcerebriform, slightly flattened, 6—6·5 mm. in diameter, 5 mm. thick, with a deep circular chalazal fovea on the centre of the raphal side; albumen homogeneous; embryo basal.

HABITAT.—Dutch Borneo; Sungei Tepussy (sic?); collected by *Jaheri*, Exp. Nieuwenhuis (No. 770, in Buitenzorg Herbarium.).

OBSERVATIONS.—In its leaves it is hardly distinguishable from *C. ruvidus;* but the spadix is much more elongate, has much longer partial inflorescences, and these have elongate dry spathes; otherwise, it is certainly very closely related to *C. ruvidus*, with which it agrees also in the appendicular parts of the spikelets, and especially in the involucre accompanied by the comparatively very large and orbicular areola of the neuter flower. If the spadix of *C. ruvidus* as represented in Plate 31 of this volume is a normal one, *C. rhytidomus* is easily distinguishable from it. Probably the male specimen collected by Motley at Banjarmasjing and mentioned by me under *C. ruvidus* (p. 170 of this volume) belongs to *C. rhytidomus.*

SUPPL. PLATE 3.—Calamus rhytidomus *Becc.* Portion of a sheathed stem with an entire leaf in two parts, ; an entire female spadix; detached seeds, one cut longitudinally through the embryo. From Jaheri's No. 770 in Buitenzorg Herbarium.

25 CALAMUS SCABRIDULUS Becc. I consider as belonging to this species a specimen with male spadices sent to me by *Ridley* and collected at Sungei Semangat, Muar. This species is not mentioned by Ridley in his "Materials for a Flora of the Malayan Peninsula."

26. CALAMUS MURICATUS Becc. A *Calamus* of the Buitenzorg Herbarium (No. 16325) collected in West Dutch Borneo by *Teijsmann*, I think, and probably in the Residency of Pontianak, native name—"Rotan Tunggal matang," apparently belongs to this species. The specimen seen by me corresponds to the type figured in plate 33 in size and armament of the leaf-sheaths, and in length and spinescence of the petiole, but the leaflets are more approximate, although inequidistant. One leaf is on the whole 1·2 m. long, its pinniferous part is 75 cm. long and has 15 leaflets on each side; the leaflets are dull on both surfaces, sparingly bristly on 1–3 nerves above, or even quite smooth; under surface and margins smooth.

27. CALAMUS ZONATUS Becc. Collected in N. W. Dutch Borneo at Sungei Kenepai, Residency of Sambas, by *H. Hallier* (No. 2020 in the Buitenzorg Herbarium). Hallier's specimens very slightly differ from that figured in plate 34 in the leaf-sheaths, which have more prominent wrinkles, the pungent warts being frequently transformed into short broad-based spines; in the male spadices which have shorter partial inflorescences, with fewer spikelets; the petiole is 5–6 cm. long; the leaflets usually have the mid-costa smooth on the upper surface, but at times this carries a straggling bristle; the lowest spathe is rather strongly flattened and armed on the edges with small horizontal spines, otherwise it is smooth; secondary spathes and spathels more or less scabrid.

To *C. zonatus* apparently belongs also a specimen of the Buitenzorg Herbarium (No. 16709), from Dutch W. Borneo, (collected, I think, by *Teijsmann* in the Residency of Pontianak) which differs from Hallier's No. 2020 in being more robust (the sheathed stem is 11 mm. in diameter) and in having the spadix, although slender, yet more rigid and with the primary and secondary spathes conspicuously scabrid all over; the leaflets are also more distinctly glossy on both surfaces: all nerves are smooth.

28. CALAMUS RADULOSUS Becc. Add :—Ridley, Mat. Fl. Mal. Penins. ii, 198.

29. CALAMUS RUGOSUS Becc. Add :—Ridley, Mat. Fl. Mal. Penins. ii, 198.

29*a*. CALAMUS DIVARICATUS Becc. n. sp.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* 7 mm. in diameter. *Leaf-sheaths* slightly gibbous above, very obliquely truncate at the mouth, in youth tigrine or alternately marked with transverse, irregular, whitish pulverulent and dark stripes, in the adult leaves distinctly striate longitudinally, armed with not many very small, scattered, triangular subbulbous horizontal spines, and ornamented with approximate, slightly raised, sinuous, interrupted ridges or wrinkles which are finely scabrid-serrulate on their crests. *Ocrea* short, membranous, deciduous. *Leaves* delicate, the only one seen by me 70 cm. long, including the petiolar part; the latter 12 cm. long, 3 mm. broad, flat on the upper and strongly convex on the lower surface, armed with a few, small, scattered claws, the edges acute; rachis trigonous, irregularly clawed on the lower surface, the salient angle of the upper surface very sharp. *leaflets* few, 12–13 on each side; the upper divaricate-horizontal, opposite in pairs, the pairs remote (usually 4 cm. apart); on the lower part of the rachis, they are more irregularly set, also distant and more or less deflexed, thinly papyraceous, slightly paler on the lower than on the upper surface, and smooth on both; they are very narrowly lanceolate, have the base acute and are long-acuminate to a very fine bristly tip, subtricostulate, the side costæ very slender; transverse veinlets sharp on both surfaces; margins minutely, appressedly and remotely spinulous; the intermediate leaflets are 20 cm. long, 13–14 mm. broad, the upper are smaller, the two of the apex are the smallest and 7 cm. long, 5–8 mm. broad, quite free at the base and with a short rigid bristle between them. *Male spadix* . . . . *Female spadix* flagelliform, slender but rigid and erect in its lowest portion; it bears only one partial inflorescence, and terminates in a long, very slender, very finely and irregularly clawed flagellum; the lowest part of the spadix is strictly sheathed by only one spathe which is 30–35 cm. long, slender, flattened, acutely two-edged, 3 mm. broad, minutely prickly and papillose-scabrid and prickly on the edges in its lower part; above split longitudinally open, flat, linear, unarmed and striate externally; the solitary partial inflorescence forms an erect, rigid panicle, elongate-triangular in outline, about 10 cm. long, and carries distichally 8–9 speedily decreasing spikelets on each side; secondary spathes strictly sheathing, densely hairy-scabrid, truncate at the mouth, produced above into a triangular membranous point; spikelets spreading, arched, inserted at the mouth of their respective spathels; the lower-spikelets are 2–2·5 cm. long, have 9–10 female-flowers on each side and as many neuter flowers which are about as large as the female so that the spikelets appear to have 4 distinct series of flowers. The upper spikelets speedily decrease in

length and number of flowers, those at the apex of the panicle are very acute and have 2–4 flowers only. *Female flowers* ovoid-subconical, acute with a flat base, 3 mm. long; the calyx boldly striately veined; the corolla polished, slightly longer than the calyx. *Neuter flowers* very much like the female, and only slightly smaller. Spathels very closely packed, bracteiform; involucrophorum and involucre similar, orbicular, shallowly cupular; the neuter flower seems to be furnished also with a special small involucre. *Fruit* small, when very young conspicuously beaked; scales convex, not grooved along the centre. The plant acquires a dark brown colour in herbarium specimens.

HABITAT.—N. W. Borneo in Sarawak on Mount Mattang near Kuching (*J. Hewitt*, Aug. 1907, in Kew Herbarium.)

OBSERVATIONS.—It is related to *C. zonatus* and especially to *C. rugosus*, and the leaf-sheaths have the peculiar armament and ornamentation proper to these; but it is easily distinguishable by the singular disposition of the leaflets in horizontal distant pairs.

SUPPL. PLATE 4.—Calamus divaricatus *Becc.* The entire type specimen in Kew Herbarium.

29*b*. CALAMUS SPHÆRULIFERUS Becc. n. sp.

DESCRIPTION.—Scandent and slender. *Sheathed stem* apparently as thick as a finger. *Leaf-sheaths* (judging from a very small portion) very scabrid and armed with small triangular ascendant prickles. *Leaves* .... *Male spadix* .... *Female spadix* slender, flagelliform, very elongate, simply branched, with only 2–3 very distant partial inflorescences and terminating in a very long, filiform, minutely and irregularly clawed flagellum; on the whole the entire female spadix is 2m. and over in length. The lowest spathe is about 30–35 cm. long, 7–8 mm. broad, closely sheathing a long way up, strongly flattened, with the edges acute and spinescent, flattish and smooth on the inner side, and more or less prickly–scabrid externally, split open in its upper part into a narrow ear–like acuminate limb, which is fringed at its apex with peculiar, flaccid, spine-like paleolæ, 15–20 up to 30 mm. long. Upper primary spathes longer than the lowest, slightly flattened and subterete, almost smooth, very closely sheathing except at their upper end, where they are also expanded into an ear-like lanceolate limb, which is also edged at its apex with the peculiar spine-like paleolæ; the basal part of the upper spathes gradually passes into the main axis of the spadix, which is angular and more or less armed with scattered claws or at times smooth. The partial inflorescences are attached above the mouth of their respective spathes, are at first erect, but when loaded with fruits become spreading and have a distinct axillary callus, are 15–30 cm. long, have a rigid, slightly sinuous, slender axial part, from which alternately part right and left 10–12 spreading or horizontal spikelets; secondary spathes tubular, frequently obsoletely angular, smooth, very closely sheathing, truncate and ciliolate at their mouth and produced at one side into a short triangular point. Spikelets inserted above the mouth of their respective spathes with a distinct axillary callus, rigid, slender, glabrescent: the lowest and

largest 6–7 cm. long with 20–25 flowers on each side: the upper ones gradually but not much smaller; spathels have a very short tubular part and suddenly expand into a bracteiform triangular acute deflexed striately veined apex; involucrophorum spread under and hidden by the involucre; the latter almost explanate, acutely 3-dentate; areola of the neuter flower depressed. *Female flowers* 2·5 mm. long, inserted at about an angle of 45°; the calyx is shortly tubular, has a broad callous base and slightly narrows above, terminating in 3 deltoid, acute, strongly striately veined teeth; the corolla is very slightly longer than the calyx. and has its divisions ovate-lanceolate acute and smooth outside; the ovary is oblong; the stigmas are relatively large and recurved. In dry specimens the calyx has the base callous and light-coloured, and the tube and teeth quite black and strongly striately veined; the divisions of the corolla are smooth and of a straw colour. *Fruit* exactly spherical, 8 mm. in diameter, very suddenly surmounted by a slender but relatively long and acute mucro. Scales few and relatively large, arranged in 12 longitudinal series; there are only 5–6 well conformed in each series, rhomboidal, broader than long, obsoletely grooved along the centre, of a general greenish straw colour, narrowly edged with red brown; the apex is bluntish but slightly produced, the margins obsoletely erose. *Seed* globular, 6 mm. in diameter, tubercled and deeply pitted all round; albumen deeply ruminated.

HABITAT.—Collected by *Teijsmann* in Dutch Borneo at Sabaloaw. In the Buitenzorg Herbarium without number.

OBSERVATIONS.—Of this I have seen the female spadix only, in flower and fruit, but no leaves. There is therefore the chance that *C. sphaeruliferus* may have already received a name as a sterile plant, and I am inclined to think that this may prove to be *C. spinulinervis* hereafter described. As it is, *C. sphæruliferus* is distinguishable from the other described species by its reproductive organs; by its extremely elongate female spadices, with only 2–3 very distant partial inflorescences; by the tubular and very long spathes, expanded above into an ear-like limb, fringed with very peculiar spine-like paleolæ; by the small, spherical, acutely beaked fruit with few but relatively large scales, and by the globular, tubercled, and pitted seed which has a deeply ruminated albumen. In the very small spherical fruits it approaches *C. nematospadix* Becc.; it somewhat resembles also *C. luridus*, but the latter has an ovoid fruit, and in no case is the apex of the primary spathes furnished with spine-like paleolæ.

SUPPL. PLATE 5.—Calamus sphæruliferus *Becc.* Fruiting spadix. The type specimen in Buitenzorg Herbarium.

29*c*. CALAMUS SPINULINERVIS Becc. n. sp.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* about 1 cm. in diameter. *Leafsheaths* (cirriferous) cylindrical, elongate, slightly gibbous above, densely beset with innumerable very small, unequal, triangular, thickish spines, flat underneath and pointing upwards, of which the largest are 2–3 mm. long and 1 mm. broad at the base and a still greater number are much smaller, but of the same description; between the spines the surface, in the newly exposed leaf-sheaths, is mottled, being glabrous where the spines remain appressed against it during the prefoliation and

furfuraceous in the interstices. The ocrea is biauricled, 2–2·5 cm. long.; the auricles are acuminate, dry, thinly membranous, glabrous and deciduous. *Leaves* elongate (non-cirriferous), about 1 m. long in the pinniferous part; the petiole is 30 cm. long (in one leaf), 5 mm. broad, flat and smooth above, convex underneath where armed with very short, scattered, tuberculiform but pungent prickles; the rachis is glabrous, armed throughout underneath with scattered diminutive claws, and with a salient smooth angle and flat side faces above. *Leaflets* very numerous, equidistant, inserted at a very acute angle, of a thin herbaceous texture, and of a very dark colour when dry, narrow, long and tapering from about the middle to a very acute base and above very gradually to a very fine and long capillary tip, sharply 3-costulate on the upper surface with the costæ, especially the lateral, furnished with a few distant spinuliform bristles; on the lower surface the three costæ are very closely covered throughout with minute hairlike ascendant spinules; the margins are very minutely appressedly and inconspicuously spinulous; transverse veinlets very sharp, much interrupted; the lower and intermediate leaflets are 30–35 cm. long and 12–15 mm. wide, towards the upper end becoming gradually smaller; the uppermost are 12–15 cm. long and very narrow. *Spadices* unknown.

HABITAT.—Collected in Dutch Borneo by *Teijsmann.* No. 16323 in Buitenzorg Herbarium, without precise locality. Malayan name "Rotan padaak."

OBSERVATIONS.—I have seen of this only the uppermost part of a plant, but no spadices or fruits; its affinities, however, are evidently with *C. rugosus*, and allied species. It is distinguishable by its leaf-sheaths which resemble a rough rasp, being armed with very minute ascendant triangular spines; by the membranous glabrous biauricled ocrea; by the very numerous herbaceous, equidistant, gradually decreasing, narrow, and long leaflets, which end in a capillary apex, are distinctly 3-costulate, and have the 3-costæ covered throughout on the lower surface with minute, very approximate, spinules, and assume a very dark colour in the herbarium specimens. See observations under *C. sphaeruliferus.*

SUPPL. PLATE 6.—Calamus spinulinervis *Becc.* The type specimen No. 16323 in Buitenzorg Herbarium.

29*d.* CALAMUS LAXIFLORUS Becc. n. sp.

DESCRIPTION.—Apparently slender or very slender. *Stem* . . . *Leaf-sheaths* not seen by me but almost certainly flagelliferous. *Leaves* (not cirriferous) delicate and elongate, with rather numerous equidistant leaflets; petiole . . . ; rachis glabrous with a salient smooth angle above and slightly concave side facets, armed relatively powerfully with several, scattered, usually solitary or sometimes geminate claws; leaflets equidistant, not very closely set, 3–3·5 cm. apart, elongately linear-lanceolate, almost equally attenuated at both ends, the base acute, gradually acuminate into a long subulate bristly tip, thinly papyraceous, rigidulous, concolorous and almost glossy on both surfaces, distinctly 3-costulate; the side costæ slender, remotely bristly from near the base, the mid-costa with a few bristles only near the apex; the undersurface is furnished usually with a few bristles on the mid-costa and occasionally with a straggling bristle on the side costæ; transverse veinlets

sharp, not very approximate; margins remotely minutely and very appressedly and therefore inconspicuously, spinulous; the intermediate leaflets 28–30 cm. long, 12–13 mm. broad; the upper ones speedily decreasing in length, but not in breadth; the two of the terminal pair, the smallest, free at the base. *Male spadix* apparently long, very delicate, thrice branched; primary spathes . . . ; partial inflorescences elongate and lax, the only one seen by me (probably one of the lower part of the spadix) is 35 cm. long and twice branched, bears 3–4 branched or compound spikelets on each side in its basal part and 9–10 simple (also on each side) from the middle upwards; the axis of the partial inflorescences is filiform and in its upper part zig-zag sinuous; secondary spathes very tightly sheathing, very narrow and very slightly infundibuliform or a little enlarged at their upper end, scabridulous and striately veined, obliquely truncate and ciliolate at the mouth, apiculate at one side; the lower compound spikelets (or secondary branches of the partial inflorescence) are 8–10 cm. long, and have 7–8 secondary spikelets on each side; the other secondary branches are shorter and one after the other have fewer secondary spikelets, and when the simple spikelets follow these also decrease in length and number of flowers; all spikelets are filiform and very slender, inserted just outside the mouth of their respective spathes, and retained in a horizontal or even deflexed position by a distinct axillary callus; the largest primary spathes are 5–6 cm. long and have 1.–13 flowers on each side; the secondary spikelets are 1–3 cm. long, and have proportionally fewer flowers; spathels infundibuliform, tapering a good deal towards the base, hairy-scabrid, truncate and entire at the mouth, produced at one side into a triangular acute or apiculate point; involucre almost completely exserted from its own spathel and laterally attached to the base of the one above, shallowly cupular, strongly striately veined, obscurely and obtusely bidentate on the posticous side. *Male flowers* bifariously horizontally inserted, 4–5 mm. apart on each side, narrow cylindraceous, 4 mm. long, and a little more than 1 mm. thick, obscurely apiculate; the calyx deeply cupular or urceolate, with 3 very broad and short acute teeth; to each tooth converge 5 very strong, prominent nerves or ribs; the corolla 3 times as long as the calyx, its segments narrowly elliptic, apiculate, obsoletely striate externally. *Female spadix* and *fruit* unknown.

HABITAT.—Singapore, at Woodlands (*Ridley* No. 12607 in Herb. Beccari).

OBSERVATIONS.—This very slender species is evidently related to the Bornean *C. zonatus*, but it is at once distinguishable from that by the leaves having more numerous equidistant leaflets, bristly on 3 nerves on both surfaces. Good diagnostic characters also are the very delicate and lax male spadix; the partial inflorescences very elongate, and, at least in part, twice branched; the slender filiform axial parts; the secondary spathes scabrid, very narrow and elongate; the spikelets filiform and very delicate, with distichous and very remote flowers; the spathels scabridulous with an infundibuliform limb, and a very narrow base; the male flowers slender cylindraceous with a strongly costulate calyx, having 5 robust nerves or ribs converging to each of the 3 teeth; and the corolla twice as long as the calyx.

Ridley informs me that he considers his No. 12607 to be a form of *C. luridus*, and indeed this number is so quoted in Ridley's "Materials" for that species.

SUPPL. PLATE 7.—Calamus laxiflorus *Becc.* Ridley's specimen No. 12607 in Herb. Beccari.

31. CALAMUS JAVENSIS Bl. Add:—*C. pencillatus* (non Roxb.) Ridley, Mat. Fl. Mal. Penins. ii, 191.

I supposed (see pp. 181, 364, 501 of this volume) that *C. javensis* could be identified with *C. penicillatus* Roxb. (printed *pencillatus*) if, in Roxburgh's description, the phrase "thirty-four pairs of leaflets" could be read "3–4 pairs." Accordingly Colonel Prain kindly looked up for me in Roxburgh's manuscript of the "Flora Indica" which is at Kew, and found that in the original diagnosis of *Calamus penicillatus* he did actually write "3–4," not "34 pairs."

Ridley also believes (Materials, ii. 192) that *C. penicillatus* Roxb. (which he ostentatiously writes *pencillatus*) is "undoubtedly" the common *C. javensis* Bl. As a matter of fact, however, Roxburgh's *Calamus* is a plant quite different from *C. javensis* of Blume, as I have been able to verify from Roxburgh's type-specimen of *C. penicillatus* in the Herbarium of the British Museum; I have also satisfied myself that this specimen exactly corresponds to Gaudichaud's plant, which Martius had rightly identified with Roxburgh's *C. penicillatus*, and which received from me the name of *C. Martianus*, and under this name is represented in plate 157 of this volume; we may even suppose that both Roxburgh's and Gaudichaud's specimen have the same origin, and are from the same gathering. In conclusion, the name of *C. penicillatus* can in nowise be substituted for the old and familiar one of *C. javensis* Bl. for they are two widely different species; it is also quite certain that *C. Martianus* Becc. is a synonym of *C. penicillatus* Roxb.

See also observations to *C. penicillatus*. (No. 129.)

Add to the localities of the "forma typica": Java, at Takoka, 1000 m., Res. Preanger, *Koorders* No. 32837*β*.; Banka at Bakaw *Teijsmann*, vern. name "Uwie pledes;" Batu Eiland (Sunda Isls.), *Raap* No. 556; Sumatra at Priaman, *Teijsmann* No. 2021. All from specimens in the Buitenzorg Herbarium.

CALAMUS JAVENSIS var. TETRASTICHUS Bl. Add:—Becc. in Engl. Bot. Jahrb. v. 48 (1912), 91.

Specimens of this variety exactly corresponding to Plate 38 of this volume, have been collected by *H. Hallier* in N. W. Dutch Borneo at Amai Ambit in the Residency of Sambas (No. 3309 in Buitenzorg Herbarium). Some of the female flowers are transformed into narrow elongate galls. Also in S. E. Borneo, at Ndessa (*Winkler* No. 3142).

CALAMUS JAVENSIS Bl. var. TETRASTICHUS subvar. MOLLISPINUS Becc.

Leaves and spadices as in variety *tetrastichus*, but the *leaf-sheaths* covered with innumerable brown, concolorous, very slender, needle-like flaccid spines, 6–10 mm. long or at times much shorter; the *female spadix* has rather short partial inflorescences which carry 6–7 spikelets kept spreading by a conspicuous axillary callus; the primary spathes have an elongate ear-like limb, which is produced 5–6 cm. beyond the insertion of the partial infloresences; the secondary spathes are also

split and spread open at the apex into a membranous limb, which subtends the base of their respective spikelets.

HABITAT.—N. W. Dutch Borneo; Sungei Mandai in the Residency of Sambas (*Hallier* No. 2569 in Buitenzorg Herbarium).

SUPPL. PLATE 7.—Calamus javensis *var.* tetrastichus *Bl. subvar.* mollispinus *Becc.* The type specimen in Buitenzorg Herbarium.

CALAMUS JAVENSIS Bl. var. INTERMEDIUS Becc.

Although not exactly agreeing with the Malayan plant we may consider as belonging to this variety *Hallier's* No. 2134 (Herb. Buitenzorg) collected in N. W. Dutch Borneo at Sungei Kenepai, Residency of Sambas, native name "R. angkut." The leaf-sheaths are armed with scattered, rather short, light coloured, slightly ascendant spines; the two lowest leaflets are ascendant and rather larger than the following; the petiolar part is 2–3 cm. long.

CALAMUS JAVENSIS Bl. var. SUBLAEVIS Becc.

To this variety belong some specimens collected by *Hallier* in N. W. Dutch Borneo at Sungei Kenepai, Residency of Sambas (No. 2130 in Buitenzorg Herbarium). In some leaves the petiole is as much as 45 cm. long, terete, and narrowly grooved on the upper surface. Probably *C. javensis* assumes this form in its first period of life, and when it grows rapidly in rich soil. I have only seen sterile specimens of it.

31*a*. CALAMUS ACUMINATUS Becc. n. sp.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 6–10 mm. in diameter. *Leaf-sheaths* distinctly striate longitudinally, unarmed or furnished especially in their lower part with a few, slender, subulate, solitary, horizontal or slightly deflexed, 5–10. mm. long, light-coloured spines. *Ocrea* membranous, ciliate, rather elongate ($\pm$ 2 cm. long) in young shoots, later marcescent and deciduous. *Leaves* about 40 cm. long; petiole quite obsolete; rachis armed on the back with small solitary claws; leaflets 10–12 on each side, subequidistant, alternate or subopposite, thinly papyraceous, narrowly lanceolate-elliptical, gradually acuminate from about the middle to an acute base and above very gradually long-acuminate to a finely subulate, slightly ciliate tip; costæ 3, slender, sparingly spinulous; margins finely spinulous-ciliate; the intermediate leaflets about 20 cm. long, 2 cm. broad; the lowest smaller, horizontal or more or less deflexed; the two of the terminal pair about two-thirds connate, somewhat shorter than the intermediate and about as broad. *Male spadix* .... *Female spadix* slender, flagelliform, inserted with a very conspicuous axillary callus; primary spathes unarmed or minutely prickly, all or at least the upper terminating in a narrowly lanceolate, acuminate membranous, ear-like limb, produced a good deal beyond the insertion of their respective partial inflorescences; the latter have a distinct but flattened axillary callus and are not kept divaricate by this but are erecto-patent; the largest (lowest) are 15–20 cm. long, and carry 3–4 spikelets on each side and terminate in a very small inconspicuous setiform appendage; the axis of the partial inflorescences is slender and strongly zig-zag sinuous; the secondary spathes are very narrow and very tightly sheathing in their lower part and

suddenly broaden at their upper end and are produced into a short ovate membranous limb, kept spreading by the base of their respective spikelets; the spikelets are usually 4–5 cm. long, kept horizontal or deflexed by a very conspicuous axillary callus; they have 15–18 flowers on each side; spathels shortly asymmetrically infundibuliform, strongly striately veined; involucrophorum shallowly cupular; involucre immersed in the involucrophorum and like it shallowly cupular, bidentate and lunately excavate on the side of the neuter flower; areola of the neuter flower lunate, sharply edged. *Female flowers* 2 mm. long, inserted at an angle of about 45°. *Fruiting perianth* almost explanate, 3 mm. in diameter, divided into 6 lanceolate almost equal segments; those of the corolla slightly longer than those of the calyx. *Fruit* very small, broadly ovoid, tipped by a thick mucro, 1 mm. long, crowned by the small recurved stigmas, 6 mm. long inclusive of perianth and mucro, and 4 mm. broad; the scales very small, in 15 longitudinal series, slightly convex, very obsoletely grooved along the centre, yellowish with a red band on the anticous margin; the apex triangular, scarious, inconspicuously toothed. *Seed* ovoid.

HABITAT.—British North Borneo. Collected by Miss *L. S. Gibbs*, Jan. 1910. at 700 ft. No. 4349.

OBSERVATIONS.—Indistinguishable from some varieties of *C. javensis* in the vegetative parts; but the flowers and especially the fruits are considerably smaller and they have a much shorter mucro. The leaflets are however more long-acuminate than in any variety of *C. javensis*; the flowers of the male spadix are inserted at a more acute angle; the involucres are more distinctly cupular; the scales are smaller than in *C. javensis*, and not at all, or only very slightly, grooved along the centre. It might perhaps be considered as a subspecies. The fruits I have seen are not thoroughly ripe but apparently have almost attained their definitive dimension.

SUPPL. PLATE 9.—Calamus acuminatus *Becc.* An entire leaf and an entire female spadix with almost mature fruits. From Gibbs's No. 4349.

32*a*. CALAMUS HYPERTRICHOSUS Becc. n. sp.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* apparently 5–6 mm. in diameter *Leaf-sheaths* (of the upper part of a young shoot) strongly striate, minutely and densely hairy-furfuraceous, armed with small ascendant light-coloured spines. *Ocrea* at first tubular, membranous, truncate and with long hairs at the mouth, later brittle and deciduous. *Leaves* on the whole about 60 cm. long, with a long petiole and only 2–3 pairs of side leaflets and one terminal flabelliform and bilobed; the petiole alone is about 30 cm. long, very slender, about 2 mm. in diameter, subterete and very narrowly grooved on its upper surface, armed with a few straight spines along the centre of the dorsum; it is densely covered with a peculiar kind of scurf, which consists of glomerules of brown vesicular cellules, borne at the end of a very slender pedicel which may be as much as 1–2 mm. long; the rachis is covered with the same kind of scurf, is unarmed and convex on the dorsum and bifaced with an acute salient angle on the upper surface; the side leaflets (2–3 in number on each side of the rachis) are elliptical-lanceolate or oblanceolate, are broadest at or a little above the middle, and taper thence towards an acute base and above to

an acuminate, slender, bristly tip; the upper pair of side leaflets are very approximate to the terminal one, which is composed of two, united the two-thirds of their length, and forms a narrow bilobed flabellum, about as long as the nearest leaflets; its lobes are obovate and abruptly contracted into a finely acuminate tip; all are herbaceous, very slenderly yet sharply 3-costulate, entirely covered on both surfaces and on the margins with very soft light coloured hairs, which rest on a small bulbous base; transverse veinlets distinct, much interrupted, not very crowded; the upper pairs of leaflets are 16–17 cm. long, 20–25 mm. broad; the others somewhat smaller. Other parts unknown.

HABITAT. Dutch Borneo, apparently in the N. W. part, collected by *Teijsmann*, but the precise locality is not stated (Buitenzorg Herbarium No. 16330). Vernacular name "Rotan lalat"

OBSERVATIONS.—*Calamus hypertrichosus* is the most peculiar species in the group to which it belongs, that of *C. javensis*, which have leaves with 3-costulate leaflets, the two of the apex being united in a bilobed flabellum. It is however distinguishable from all, by the soft hairy down which entirely covers both surfaces and the margins of the leaflets; it is also peculiar in that the indumentum covers the long and terete petioles. It approaches *C. javensis* var. *acicularis* by its leaves having very few leaflets and a long terete petiole.

SUPPL. PLATE 10.—Calamus hypertrichosus *Becc.* The type specimens No. 16330 in the Buitenzorg Herbarium.

33. CALAUS CORRUGATUS *Becc.*

It has been found again by *Hewitt* in Sarawak on Mount Poe (July 1908) according to a specimen from the Sarawak Museum, now in the Herbarium at Kew. This specimen corresponds as to the leaves and the leaf-sheath to plate 43 of this volume, and bears a fruiting spadix of which I subjoin a description.

This *female spadix* is very similar to that of *C. javensis* and is attached by means of a callosity exactly to the mouth of its leaf-sheath opposite to the base of the petiole; it is very slender, filiform, 1·15 m. long, and carrys only 3 partial inflorescences towards its upper end. Primary spathes very narrowly tubular, very closely sheathing, very finely aculeolate especially in their lower slender part; they end in a small lanceolate auriculiform limb which is produced beyond the insertion of its respective partial inflorescence. The partial inflorescences are small, 8–30 cm. long, carry only 2–4 spikelets on each side, and are attached to the main axis by means of a rather conspicuous axillary callus. Secondary spathes tubular, slightly enlarged above, unarmed, puberulous-furfuraceous, ciliolate at the mouth. Spikelets spreading or horizontal, 4–5 cm. long, with about 12 flowers on each side; spathels bracteiform with a slightly concave horizontal bluntish limb; involucrophorum slightly concave, laterally attached to the base of the spathel above its own, somewhat produced at one side and subtending the base of the neuter flower; involucre cupular, entire; areola of the neuter flower rather large, almost crescent-like and with raised edges. *Fruit* ovoid-elliptical, rounded at both ends but surmounted by a conspicuous cylindrical slender mucro, 3 mm. long upon which rest the remains of the stigmas. The *fruit* is 10–12 mm. long—not taking

into account the mucro—and is 8 mm. broad. Scales arranged in 15 longitudina series, of an almost uniform greenish-yellow colour with a lighter marginal line and occasionally slightly tinged with reddish brown at the apex; they are gibbous on their posticous part and depressed towards the apex, and are deeply grooved along the centre; the apex is blunt and—like the margin—obsoletely and finely erose-ciliolate. *Seed* oblong, 8 mm. long, 5 mm. broad and a little less thick; chalazal fovea suborbicular and situated in the centre of the side which is flattish, while the other side is convex on the whole but presents 4–5 slightly concave facets; albumen homogeneous; embryo basal. *Fruiting perianth* almost entirely explanate; the calyx parted down to the middle into 3 broad triangular lobes and obtusely veined-costulate; the divisions of the corolla are lanceolate-acuminate, dull outside and about one and a half times longer than the calyx.

33*a*. CALAMUS IMPAR Becc. n. sp.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* 5–6 mm. in diameter. *Leaf-sheaths* slightly gibbous above, more or less distinctly striate longitudinally, appressedly and fugaciously furfuraceous, quite smooth or sparingly armed with very short, triangular, slightly ascendant spines. *Ocrea* cylindrical, truncate, 10–15 mm. long, striate, glabrescent or sparingly furfuraceous, membranous, later dry and brittle. *Leaf-sheath flagella* very slender, thread-like. *Leaves* very small, 15–20 cm. long on the whole, usually with only 4 leaflets, of which the two terminal are connate for two-thirds or half their length, one is in immediate proximity to the terminal pair, and the other is only 15–25 mm. below that and is solitary on the other side of the rachis; rarely to this solitary leaflet is opposed another; petiole and rachis on the whole 5–7 cm. long; the petiole is subterete, very narrowly grooved on the upper surface, armed along the centre of the dorsum with a few small solitary claws. *Leaflets* papyraceous, very rigid, almost glossy on the upper surface, duller and slightly paler underneath, all very sharply 3-costulate, lanceolate or narrowly ovate elliptical, somewhat cancavo-convex, almost equally tapering and acute at both ends; the nerves on both surfaces and on the margins are quite smooth; transverse veinlets rather sharp, parallel and rather approximate; the side leaflets are 7–12 cm. long, 15–25 mm. broad, the two of the terminal pair, which are united to form a cuneiform flabellum, are longer and broader than the others (15–18 cm. long, 3·5–4 cm. broad and very suddenly apiculate. *Male spadix* slender, longer than the leaves; it has very few remote spreading partial inflorescences; the pedicellar part with its spathe is flattened and smooth; the primary upper spathes are very strictly sheathing, truncate at the mouth, armed with very small claws; partial inflorescences spreading, with only 2–3 horizontal spikelets on each side; secondary spathes very strictly sheathing, smooth; spikelets filiform, their axes terete and sinuous between the flowers, 2–3 cm. long, with 6–8 distichous flowers on each side; spathels rather elongate, cylindrical and smooth in their basal part, infundibular and striately veined above, truncate at the mouth; involucre cupular, obsoletely toothed, laterally attached to the base of the spathel above its own. *Male flowers* not very close together (3–3·5 mm. apart). Other parts unknown.

HABITAT.—Dutch N. W. Borneo, Sungei Kenepai in the Residency of Sambas, collected by *H. Hallier* in 1893–94 (No. 2033 in the Buitenzorg Herbarium).

OBSERVATIONS.—Easily distinguished amongst the species of the group of *C. javensis* by its short leaves with a terminal deeply bilobed flabellum and two side leaflets, which are not opposed, one being in close proximity to the flabellum, and the other 1–2 cm. below on the other side of the rachis. In only one of the several leaves seen by me, have I found 3 side leaflets of which the two lowest were opposed.

SUPPL. PLATE 11.—Calamus impar *Becc.* Upper end of a plant with a male spadix; portion of a sheathed stem with a leaf and the base of a flagellum. From Hallier's No. 2033 in the Buitenzorg Herbarium.

35. CALAMUS FILIPENDULUS Becc. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 193.

Ridley adds the locality of Rawang in Selangor.

37. CALAMUS FLORIBUNDUS Griff.

Mr. Burkill has sent me specimens of this, collected on the Kulsi Range in Assam (Herb. Rep. Econ. Prod. of India, No. 20002). Vernacular name "Charai bagula."

40. C. SCHISTOACANTHUS Bl.

Of this, which was known in a sterile condition only, I have examined in the Buitenzorg Herbarium some nearly complete specimens, with female spadices, collected by *Hallier* in N. W. Dutch Borneo at Sungei Smittouw (No. 1282).

These specimens agree entirely with that represented in Plate 52 of this volume, which was said to have been collected by Praetorius in Sumatra. Nevertheless I consider this statement as uncertain, while it is quite certain that Borneo is the home of *C. schistoacanthus.*

DESCRIPTION.—Hallier's specimens have the leaf-sheaths (flagelliferous) 10–15 mm. in diameter; densely armed with the characteristic schistaceous, slightly ascendant spines, which have a conspicuous, smooth, light coloured swelling above them at the base. *Leaves* 65–70 cm. long; the leaflets are 18–24 in all, of which 2–3 pairs are very near the base, otherwise they have as already described a tuft of black bristles at the apex and are dotted underneath with small brown scales. *Male spadix* . . *Female spadix* flagelliform, very slender and elongate, about 1·5 m. long and terminating in a filiform, very minutely clawed flagellum; it is very simple, and has only 2–3 undivided, very distant, partial inflorescences; primary spathes tubular, very strictly sheathing, very elongate; the lowest 20–25 cm. long, 5–6 mm. broad, strongly flattened, acutely 2-edged, smooth or minutely prickly on the dorsum, obliquely truncate at the mouth, and produced into an obtuse point, which terminates in a dense tuft of hairs; the other primary spathes are terete, very slender, 2–3 mm. in diameter, very minutely and sparsely clawed and have also a tuft of hairs at their apex; partial inflorescences 30–50 cm. long, flaccid, filiform, with alternately 6–7 small gradually diminishing spikelets on each side and terminating in a small, slender, minutely clawed, tail-like appendage; secondary spathels closely sheathing, elongate-infundibular, 3–4 cm. long, beset with very minute scattered claws, obliquely truncate and ciliate at the mouth and produced into a triangular bristly apex; spikelets inserted above the mouth of their respective spathes, erect, quite appressed to the main axis, sub-terete and rather rigid, small and few-flowered; the lower (largest) 2·5–3 cm. long,

have 4–5 distichous flowers on each side, while those near the upper end are very short and have only 3–4 flowers in all; spathels obliquely infundibuliform, nearly smooth, fugaciously rusty-furfuraceous; involucrophorum subcupular, laterally attached to and almost excavate within the base of the spathel above its own; the involucre is asymmetrically cupular and rather deep; it carries laterally the areola of the neuter flower, very conspicuous, callous, suborbicular, concave and at times forming also a shallow cupula, slightly smaller than that of the female flower. *Fruiting perianth* not pedicelliform; the calyx split into 3 parts down to the base; the segments of the corolla lanceolate, acute, slightly longer than the calyx. *Fruit* small, ovoid, 11 mm. long, 7 mm. broad, contracted at the apex into a conspicuous conical beak; scales subsquarrose, arranged in 21 longitudinal series, flattish and not grooved along the centre, yellowish brown, tinged of dark-red towards the apex which is rather acute and often toothed.

OBSERVATIONS.—The spadix of *C. schistoacanthus* is very similar to that of *C. leptospadix*, but the spikelets of the first are inserted outside (not inside) the mouth of their respective spathes. I do not know to which of the known species it may be said really to be related; perhaps it approaches *C. pseudo-tenuis* and could be placed near that species.

SUPPL. PLATE 12.—Calamus schistoacanthus *Bl.* Sheathed stem; an entire leaf and an entire female spadix in flower, portion of a fruiting spadix. From Hallier's No. 1282 in Buitenzorg Herbarium.

44. CALAMUS VIMINALIS Willd. var. FASCICULATUS Becc. Add:—Prain in Records Bot. Surv. Ind. iii, 294 (1905) "The Vegetation of the districts of Hughli-Howrah and the 24-Pergunnahs" where it is given the locality: "Village shrubberies, general." Native name, "Bara bet."

44. CALAMUS VIMINALIS Wild. var. PINANGIANUS Becc.

Ridley mentions (Mat. Fl. Mal. Penin, ii, 213) Wallich's No. 8611 (of which I have made the variety *pinangianus*) and writes of it: "This has never been seen again in the peninsula, and it is an Indian species; the locality is probably erroneous." We may however also suppose that the plant has been destroyed in Penang, as the presence of this plant in Penang could not be considered an extraordinary fact, considering that *C. viminalis* with its numerous varieties is not a localized Indian plant, but a rather widely diffused species in Southern Asia and Java.

46. CALAMUS CONCINNUS Mart. Add:—*C. multirameus* Ridley, Mat. Fl. Mal. Penins. ii, 202 (only as to the fruit).

It has been found again by Ridley at Dinding in Perak (No. 8405 partly) as the fruit attributed by Ridley to *C. multirameus* really belongs to *C. concinnus*. See observations to *C. Guruba*.

47. CALAMUS MOLLIS Blanco. Add:—Becc. in Webbia di U. Martelli i, 345 and in Philip. Journ. Sc., iii, 342; C. B. Robinson in Philip. Journ. Sc., vi, 117.

C. usitatus (not of Blanco) Vidal, Fl. Forestal de Filp. Atlas, t. XCIII D.

Very widely spread in Luzon: to the already given localities add the following: Prov. Cagayan, *Curran*, No. 17273, vern. name "Barit" (The rattan of this specimen is 15 mm. in diameter, yellowish green with a very fine polished vitreous surface, the internodes 24 cm. long); Lamao River Mt. Mariveles, *Merrill* No. 3026, and T. E. Borden No. 2481; Antipolo, Prov. Rizal, *Ahern's collector* No. 389 (the sheathed stem is 2 cm. in diam.); Prov. Bataan *Curran*, No. 6372, vern. name "Abit" (the rattang of this specimen is only 7 mm. in diam.); Boso boso, Prov. Rizal, *Maximo Ramos* No. 381; Balinag, Prov. Bulacan, *C. B. Robinson* No. 9571 the sheathed stem is only 1 cm. in diam., vern. name "Uay"); Distr. of Bortoe, *Curran*, No. 7034; Prov. Ilocos Norte, *Maximo Ramos* No. 7723; Prov. Nueva Ecija, *Curran* No. 8484 all the above from the Herbarium at Manila). Montalban Prov. Rizal, No. 7081 and Manila No. 7080, *Loher* in Herb. Kew. Very slightly different from the above specimens are others collected in Mindanao:-Moro Province, *Hutchinson* No. 4819 (Herb. Manila); Prov. Surigao, *Bolster* No. 347 (Herb. Manila); Mt. Apo, District of Davao, *Elmer* No. 11969. In this last specimen the fruits are smaller than in those from Luzon, are globular ovoid, and 6–7 mm. in diameter. Perhaps the plant from Mindanao represents a local variety.

A specimen collected by *Foxworthy* in the Island of Palawan (No. 609) is barely distinguishable from some specimens collected in Luzon, and differs from the variety *palawanicus* only in the leaf-sheaths armed as usual in the Luzon specimens although very scantily.

A specimen collected by *Eugenio Fenix* (No. 4032 in Herb. Manila) in the Camiguin Islands, one of the Babuyanes, has the leaf-sheaths almost unarmed, otherwise it does not differ from the typical specimens.

Calamus mollis is cultivated in small quantity at Balinag in Luzon and furnishes the material for making very high grade hats. According to Dr. C. B. Robinson, who has written a very interesting and full account of Philippine Hats [Philipp. Journ. of Science, vi, No. 2. (1911). Botany] the "parts used are the intermediate layers of the stem, which are prepared in the same way as bamboo, except that boiling is unnecessary. They are sufficiently strong to permit finer division than any other Philippine material. Consequently with their satiny sheen, the higher grades of rattan hats are extremely beautiful, but beyond a limit, which may vary with individual taste, they are rather works of art than usable commodities. Nearly all the rattan hats on the market come from Balinag; Calasiao makes them when ordered, and there is elsewhere a scattered but very scanty production." Fairly fine hats command a price of from 5 to 8 dollars (U. S. currency) but the upper limit of price "is lost in fable" as Dr. Robinson says.

CALAMUS MOLLIS Blanco var. PALAWANICUS Becc. in Philipp. Journ. Sc., ii, (1907) 233.

DESCRIPTION.—*Sheathed stem*, 12–15 mm. in diameter. *Leaf-sheaths* remaining green when dry, more or less longitudinally striate, spineless or with some scattered relatively strong spines. *Ocrea* dry, reddish-brown, spinulous or at least tubercled-spinulous. *Leaflets* more or less inequidistant, often approximate in pairs

on each side of the rachis or at times almost equidistant, otherwise as in the typical form, but the margins not so strongly spinulous. *Spadix* with smooth primary spathes.

HABITAT.—Palawan: in old clearings, locally quite common, *Curran* No. 3613 (male plant); at Puerto Princesa, *J. Bermejos* No. 191, 196 (female plant); all the above specimens in the Herbarium at Manila; Brook's Point (Addison Peak) also in Palawan (*Elmer* No. 12607).

OBSERVATIONS.—It slightly differs from typical *C. mollis* Blanco of Luzon, by its leaf-sheaths being smooth, or almost so; in any case the few spines with which they are armed are much more robust than usual. It is barely distinguishable from *C. Meyenianus* Schauer by the ocrea being more or less spinulous, and by the leaflets having more strongly spinulous margins. *C. Meyenianus* itself is scarcely a distinct species and had better be considered as a variety of *C. mollis* Blanco. Elmer's specimen No. 12607, which has no leaf-sheaths is indistinguishable from the typical *C. mollis* of Luzon.

CALAMUS MOLLIS Blanco var. MAJOR Becc. in Webbia di U. Martelli, i, 345; Merrill in Philip. Journ. Sc. i, (1906), 31.

HABITAT.—Philippines, Luzon, Lamao River, Monte Mariveles, *Whitford* No. 80; in the same locality *R. Meyer* No. 2499. Both in the Manila Herbarium.

DESCRIPTION.—A plant more robust than usual, but connected with the more slender forms by numerous intermediate specimens. *Sheathed stem* 2·5–3 cm. in diameter. *Leaf-sheath* densely armed, especially at the mouth, with flexible, acicular, nearly filiform spines. *Leaves* up to 1·20 m. in length, with the petiole armed on both surfaces with scattered prickles; leaflets distinctly geminate on the lower part of the rachis, rather numerous, narrowly lanceolate, strongly spinulous on the margins, on 3 nerves of the upper surface, and on the mid-costa underneath.

I have examined a very large number of specimens of *C. mollis* and I have found that it is a very variable plant as to the general dimensions of the stem (from 1 to 3 cm. in diameter) and as to the spinescence of the different parts. It is therefore difficult to establish well defined varieties of it, as one merges into the other by intermediate forms.

47*a*. CALAMUS PSEUDO-MOLLIS Becc. n. sp.

C. sp. A.; Koorders in Verslag etc. Fl. N. O., Celebes, 291.

DESCRIPTION.—Scandent, apparently rather slender. *Sheathed stem* . . . *Leaf-sheaths* . . . *Leaves* (not cirriferous) very regularly pinnate; petiole elongate, about 1 cm. broad at its base, somewhat flattened-biconvex, very densely beset on the upper surface with very unequal, straight, scattered, needle-like spines—of which the largest are 10–12 mm. long—intermingled with many others much smaller; the lower surface is smooth except for a few solitary claws along the centre; the margins are acute and armed with spreading acicular spines longer than those on the upper surface. Rachis glabrous, armed underneath, in its upper part, with a single line

of solitary claws, smooth and with an acute salient angle above. *Leaflets* numerous very regularly equidistant, inserted at an angle of about 45°, 2–2·5 cm. apart, thinly papyraceous, almost equally green on both surfaces, lanceolate-ensiform or narrow and long, narrowing from below the middle to an acute base and above; the mesials (and probably also the lower ones not seen by me) very gradually long-acuminate to a bristly tip; in the uppermost leaflets the point is less acuminate and more bristly; they are not very prominently 3-costulate, the side costæ being slender and slightly stronger than two other secondary nerves on each side of the mid-costa, of which one runs very near to each margin; the 3 costæ, but especially the laterals, are furnished with a few but very conspicuous and long spadiceous bristles; on the under surface the mid-costa alone bears a few scattered bristles smaller than those on the upper surface; the margins are ciliate with fine remote spreading cilia closer and longer near the apex; the intermediate leaflets are 35–38 cm. long, and 18–20 mm. broad; they gradually decrease, especially in length, towards the upper end, the ultimate leaflets being reduced to 8 cm. in length and to a few millimeters in width; transverse veinlets much interrupted, translucent. *Male spadix* . . . . *Female spadix* certainly elongate and probably cirriferous at its upper end and with several partial inflorescences; primary spathes cylindrical, elongate, very closely sheathing; one of the lowest is 8 mm. in diameter and is produced above to an elongate triangular point which is densely bristly-hispid on its back, otherwise is sprinkled with very small tuberculiform prickles; upper spathes also cylindrical and sprinkled with small prickles but with the apex not hispid; the axial part of the spadix is flagelliform and rather robust; the spaces between two partial inflorescences are long, flattened-biconvex with rather acute edges in their basal part, smooth on the inner side, and powerfully armed externally with irregularly set or more or less approximate black claws; partial inflorescences 40–45 cm. long, rising erect from above the mouth of their respective spathes, strongly arched, and with 12–15 speedly decreasing spikelets on each side; secondary spathes tubular, elongate-infundibuliform, glabrous and unarmed, finely striately veined, obliquely truncate at the mouth, and apiculate at one side; spikelets inserted above the mouth of their respective spathes, spreading, flattened, of very unequal length, with numerous, very approximate, flatly bifarious flowers; the lower spikelets are 7–9 cm. long and have 25–30 flowers on each side, the upper are speedily shorter and with fewer flowers and the uppermost are reduced to 10–15 mm. in length and with 6–10 flowers only in all. Spathels very approximate, briefly asymmetrically infundibuliform, slightly produced at one side into a triangular acute point; involucrophorum cupular, bidentate and two-keeled on the side next to the axis; involucre deeply cupular, truncate, moulded on the involucrophorum and both slightly protruding above their own spathel; areola of the neuter flower conspicuous, niche-like and rather deep. *Fruiting perianth* not pedicelliform, 4 mm. long; the calyx split down to the base into 3 ovate, striately veined, acute lobes; the corolla a little longer than the calyx, the segments acute. *Fruit* ovoid-elliptical, equally rounded at both ends but suddenly surmounted by a short subcylindrical mucro, 11 mm. long inclusive of the mucro and perianth, 7 mm. broad; scales arranged in 18 longitudinal series, of a dirty straw colour with very narrow lighter scarious edges, at times tinged with red-brown especially towards the bluntish point, convex and rather deeply grooved especially on the posticous part. *Seed* irregular, slightly

longer than broad, slightly flattened, very boldly tubercled or superficially lobulate, 5–7 mm. long, 4 mm. broad; when it is freed from the thin crustaceous (in the dry condition) black integument it has the surface polished and of a spadiceous colour; the chalazal fovea is punctiform, inconspicuous and superficial; albumen homogeneous. Embryo basal.

HABITAT.—N. E. Celebes: Prov. of Minahassa near Kajuwatu at about 50 m. elev., *Koorders* No. 18395β, vernacular name "Pondos taisi" and "Pondos aret raindang", and No. 18113β from the same locality, native name "Pondos wasal."

OBSERVATIONS.—Very similar to *C. mollis* Blanco of the Philippines of which it is apparently the representative form in Celebes. It differs from *C. mollis* by its very regularly set leaflets, which bear very long bristles on 3 slender costæ on the upper surface, but only on the mid-costa below, and have the margins spreadingly and distinctly ciliate, (not spinulous). The spikelets are also longer than in *C. mollis;* the fruit is slightly smaller, with more numerous and smaller scales, and smaller seed, than in the latter.

SUPPL. PLATE 13.—Calamus pseudo-mollis *Becc.* Upper portion of a leaf; a partial inflorescence with fruits. From Koorders No. 13395β in Buitenzorg Herbarium.

48. CALAMUS MEYENIANUS Schauer. Add:—Becc. in Webbia di U. Martelli, i, 346.

49. CALAMUS BLANCOI Kunth. Add:—Becc. in Webbia di U. Martelli i, 346 and in Philip. Journ. Sc., iv, Botany, (1909), 635.

A specimen with a female spadix collected near Zamboanga in Mindanao by *W. J. Hutchinson*, July 1906 (Forestry Bureau Manila No. 4819) does not differ from other specimens from Luzon and Leyte that I have seen. It is therefore, apparently, a constant form, although very closely related to *C. mollis.*

51. CALAMUS METZIANUS Schlecht.

I have seen in the Berlin Herbarium another of Hohenacher's specimens of this little known species, but it is hardly more complete than the others. The sheathed stem is 1 cm. in diameter. The leaf-sheaths are very similarly armed as in *C. rivalis* with yellowish, feeble spines, 5–15 mm. long. The leaves have no petiole; the rachis, in its lowest part, is slightly concave on the upper and convex on the lower surface, while the lowest leaflets are inserted along a longitudinal furrow on each side of it.

52. CALAMUS PSEUDO-RIVALIS Becc.

Of this species I have described (p. 222 of this volume) the fruiting spadix only, the other parts being at that time unknown. Now I consider as belonging to it some more complete specimens collected in the year 1904 by Mr. C. G. Rogers in Baratang Island, one of the South Andamans (Nos. 48, 49 in Calcutta Herbarium). The specimens of No. 49 are more spinous in every part, especially on the leaf-sheaths and petioles, than those marked No. 48, which have these parts quite unarmed. I do not however think it necessary to consider these last specimens as belonging to a distinct variety for, by experience, I know that the degree of spinescence is a very misleading and inconstant character, if it is not accompanied by other peculiarities.

Mr. Rogers gives the vernacular name of "China Bet" to his No. 49, and says of it that it produces the best white Andamans cane and first quality Rattan. Of No. 48 he gives the native name "Saffed Kupri," and says that it reaches a length of 50 feet, dries white, and is exported with its root as a second quality of Rattan. Another specimen which has a more slender stem than those now mentioned, and has quite smooth leaf-sheaths, bears the name "Hasli Bet," and the note "stem $\frac{3}{8}$ths of an inch, dries white, used for making fine baskets." I subjoin the descriptions of Roger's specimens:—

Sheathed stem. 2·5–3 cm. in diameter. *Canes* 12–16 mm. in diameter, whitish when dry. *Leaf-sheaths* (flagelliferous) gibbous above, obliquely truncate at the mouth, thickly coriaceous or almost woody, greenish or light yellowish-brown when dry, partially covered with a fugacious, thin, blackish scurf, later glabrescent, unarmed or more or less furnished with uniform chestnut brown, laminar, triangular-lanceolate, very sharp, 10–15 mm. long, ascendant spines of which some near the mouth on the outer side are larger than the others. *Leaves* (non-cirriferous) about 1 m. long; petiole 13 cm. long, 13–14 mm. broad (in one specimen), plano-convex, the upper surface flat and irregularly sprinkled with short erect prickles, smooth underneath; the edges rather acute, armed with not many spreading or even deflexed, straight, not very large spines; in another specimen the petiole is quite unarmed; rachis in the intermediate portion trigonous, with an acute smooth salient angle above and flat side faces, irregularly armed on the back with small solitary scattered claws; leaflets numerous; equidistant, rigid, papyraceous, green on both surfaces, glossy above, not very approximate (4–6 cm. apart), elongate-lanceolate or ensiform, the intermediate ones, and largest, 30–40 cm. long, 2·5–3·5 cm. in width, broadest below the middle and narrowing thence towards a rather acute base and very gradually acuminate above towards a rather rigid bristly spinulous subulate tip, which is often conspicuously indented on the lower margin; the upper leaflets gradually smaller and more approximate, those of the apical pair united by their bases and 7–15 cm. long: on the upper surface the mid-costa is acute, spinulous only near the apex, the secondary nerves are slender and unequal, one on each side of the mid-costa being stronger than the others, scantily spinulous or smooth; underneath the mid-costa alone is sparingly bristly spinulous; transverse veinlets numerous, rather sharp and continuous; margins closely serrate with short but comparatively strong spinules. *Leaf-sheath flagella* very long, up to 3·5 m. (Rogers), and robust, flattened, acutely two-edged, 1 cm. broad, armed with ascendant spines in their basal part and irregularly armed with solitary or even ternate but not regularly digitate or half whorled claws higher up. *Male spadix* supradecompound, very long (3·7 m. Rogers), made up of 5–6 superposed branches or partial inflorescences, the apical portion flagelliform and armed with short claws; the primary spathes are tubular, elongate, sprinkled with very short prickles and terminating in a triangular-lanceolate, dorsally keeled point; axial parts of the spadix between two partial inflorescences armed with irregular claws; partial inflorescences elongate, arising erect from inside their own spathes, 40–50 cm. long, divided into 3–5 branchlets in their lower part and into many single spikelets in the remaining portion; secondary spathes papyraceous, smooth, very narrowly infundibuliform, usually longitudinally split on the ventral side, obliquely truncate at the mouth and produced at one side into a

triangular point; the branchlets are spreading, arched, inserted inside but near the mouth of their respective spathes, and have 7–10 spikelets on each side; the spikelets of the branchlets are short, 12–20 mm. long, and have 6–12 flowers on each side, the others are up to 5–6 cm. long and have a proportionate number of flowers; spathels very closely packed, very shallowly asymmetrically infundibuliform, striately veined, entire, produced at one side into a broadly triangular point, which subtends its flower and after the fall of the latter protrudes beyond the involucre; the involucre dimidiately cupular, acutely bidentate, two-keeled and lunately excavate on the side next to the axis. *Male flowers* ovate.

53. CALAMUS PSEUDO-TENUIS Becc. Add:—Cooke, Fl. Bomb. ii, 806.

To the localities add: Kanara, common on the Ghâts of N. Kanara, *Talbot* ex Cooke. l. c.

54. CALAMUS HOOKERIANUS Becc.

A specimen of this little known palm, has been collected by Mr. A. Meebold in the forests of Kandy in Ceylon, at about 600 m. elevation (No. 3288 in the Breslau Herbarium). The true habitat of *C. Hookerianus* had remained so far somewhat uncertain, but with the discovery of this plant in Ceylon, there is no ground to doubt the locality of Courtallum assigned to the type specimens of it, as many species of plants are inhabitants of Ceylon and at the same time of the southern part of India.

In the Philippine Journal of Science (Botany) v, (1909), 621, I referred to *C. Hookerianus* a plant which now I consider to be new species hereafter to be described under the name of *C. filispadix*.

Probably *C. Hookerianus* has been confused by Ceylon botanists with *C. delicatulus* Thw., which it somewhat resembles in its slender stems, and in its very long spadices.

Meebold's specimen consists of a portion of a spadix with very young fruits, and of a leaf, apparently a radical one, having its sheath spread open and not tubular. The *leaf* on the whole is about 65 cm. long. The *leaf-sheath* is armed with long, straight, horizontal, very slender, needle-like spines; the petiole and the rachis in its lower portion are armed with a similar kind of spines, of which some are as much as 7 cm. long; leaflets numerous and equidistant, smaller than those of the type specimen, bristly on 3 nerves on the upper surface and quite smooth on the lower. The *spadix* (female) is said to be 3 m. long (Meebold); the axial portions between two partial inflorescences are very long and powerfully armed with more or less aggregated claws exactly as in the type specimen; one of the inflorescences, apparently of the upper part of the spadix, is 60 cm. long; some of the spikelets are 16 cm. long, and carry up to 20 flowers on each side; secondary spathes almost smooth or with a straggling, very small claw here and there. *Flowers* inserted at an angle of about 45° and about 8 mm. apart on each side; perianth slightly callous at its base.

The Ceylon plant differs but very slightly from that of the continent; the spadix seems slightly more delicate, the spikelets slightly more slender, and at

times longer, and with more numerous flowers : the leaflets have no bristles on the mid costa on the lower surface; but, as I have already said, Meebold's specimen has only a radical leaf, and it is not therefore exactly comparable with those of the type specimen.

Wright's specimen from Courtallum (in Kew Herbarium) has spherical fruits, 8 mm. in diameter, surmounted by a cylindrical beak ; the seed is erbicular, 5 mm. in diameter, coarsely pitted, and with a deep chalazal fovea in the centre of the raphal side.

SUPPL. PLATE 14.—Calamus Hookerianus *Becc.* Meebold's specimen in the Herbarium at Breslau. Lower part of a leaf with portion of its leaf-sheath ; upper end of a leaf ; an entire partial inflorescence with very young fruits.

54*a*. CALAMUS FILISPADIX Becc. in Philip. Journ. Sc., vi, (1911), 230.

C. Hookerianus Becc. in Philip. Journ. Sc., v, (1909), 621, (non in Ann. Bot. Gard. Cal. xi, 226, Pl. 70).

DESCRIPTION.—Slender. *Sheathed stem* about 2–2·5 cm. in diameter. Naked canes 13–14 cm. in diameter with a straw coloured polished surface and internodes 14 cm. long. *Leaf-sheaths* strongly gibbous above, densely armed with very uneqnal spines, of which some are large, arranged in horizontal approximate rows, and confluent by their bases, laminar, lanceolate or elongate-triangular, 12–20 mm. long and at times longer, dark brown with a lighter, slightly swollen, 6–7 mm. broad base; the spaces between the rows of large spines are covered with similar spines but much smaller, very unequal, and scattered or slightly confluent; the mouth of the sheath is edged by a narrow membranous rim, representing the ocrea. *Leaves* elongate (non cirriferous), about 1·5 m. long (in one specimen) in the pinniferous part; petiole about 25 cm. long, concave on the upper surface near the base, flattish higher up and more or less prickly throughout; the lower surface is convex with a line of small claws along the centre and with the edges acute and armed with several rather large horizontal spines; the first portion of the rachis is convex and irregularly armed on the lower surface with several robust claws; on the upper it has a deep furrow on both sides for the insertion of the leaflets and a narrow, flat, and at times slightly prickly surface; along the centre, higher up, the rachis is more regularly armed with 2–3-nate claws underneath and on the upper surface has a very sharp salient angle smooth or minutely and sparingly prickly. *Leaflets* numerous, equidistant, rather closely set, 2·5 – 3·5 cm. apart on each side of the rachis, regularly alternate, papyraceous, rigidulous, almost of the same colour on both surfaces, linear-ensiform, tapering lower down towards a rather acute base, gradually acuminate towards the apex from below the middle, sharply 3-costulate; the 3 costæ are very sharp and sparingly bristly only from above the middle on the upper surface, and on the lower are slender and closely covered with short fulvous bristles; the margins, especially the lower, are slightly thickened and very minutely and inconspicuously spinulous; transverse, veinlets fine and rather numerous; the intermediate leaflets (largest) are 50 cm. long, 18–20 mm. broad, and have a very acuminate and bristly apex; those near the base are narrower but not shorter; the upper ones gradually shorter;

those near the end terminate in a bluntish and conspicuously bristly apex; the two of the terminal pair very narrow, and quite free, at the base. *Male spadix* similar to the female and also extraordinarily long, ultra-decompound; partial inflorescences very long, 1·20 m. in one specimen, and with several remote spikelet-bearing branches; each secondary branch 15–30 cm. long, bearing 8–12 spikelets on each side; the spikelets are short, 15–20 mm. long and have 8–10 very approximate flatly bifarious flowers on each side. *Female spadix* extraordinarily long (6 m. according to the collector) slender and flagelliform, simply decompound, armed on the back of the attenuated unsheathed axial portions, between the partial inflorescences, with strong, more or less aggregate or 2–3-nate claws; primary spathes tubular, all entire, very narrow and long, and very closely sheathing: the lowest somewhat flattened and acutely two-edged, densely armed with unequal, straight spines; the upper spathes cylindrical, sprinkled with small claws, truncate, glabrous and acute on one side at the mouth; partial inflorescences very slender and long, (75 cm. long in one specimen) with 6–7 spikelets on each side and a filiform aculeolate appendix at their apex; secondary spathes concavo-convex and smooth in their lower part and very narrowly tubular, slightly enlarged, yet very closely sheathing above, about 4–5 cm. long, armed all round in their upper part with very minute claws, entire, glabrous, obliquely truncate and acute at one side at the mouth; spikelets inserted just at, or a little above, the mouths of their respective spathes, horizontal or deflexed, slightly callous in the axilla, subterete, thickly filiform and rigid, slightly zig-zag sinous between the insertion of each flower, all of about one size, 10–12 cm. long, with 12–14 distichous flowers on each side; spathels infundibuliform, 3–4 mm. long, truncate, entire and glabrous at the mouth, very shortly apiculate at one side, obsoletely veined; involucrophorum almost wholly exerted from its own spathel and laterally attached to the base of the one above, shallowly cupular; involucre moulded on the involucrophorum, and also very shallowly cupular, irregularly and obscurely lobulate at the margin; areola of the neuter flower callous, lunate. *Female flowers* small, 3·5mm. long. *Fruiting perianth* forming a rather distinct pedicel to the fruit; the calyx split down almost to the callous base into 3 ovate lobes; the corolla about as long as the calyx. *Fruit* ovoid-elliptical, 11–12·5 mm. long, including the perianth and the beak, 7 mm. broad, almost equally and rather suddenly contracted at both ends, the base caudiculate, the apex conically beaked; scales arranged in 15 longitudinal series, very faintly grooved along the centre, light yellowish with a black edge; the margins very finely erosely toothed, the apex triangular, bluntish. *Seed* globular-ovoid, 7 mm. long, 5·5 mm. broad, deeply and coarsely pitted: chalazal fovea orbicular in the centre of the raphal side.

HABITAT.—The Philippine Islands in Luzon, *H. M. Curran* at about 200 m. elevation on the Adlamay Hills, Province of Albay, (No. 10630, Herb. Manila); Kabibihan, Prov. Tayabas, *Foxworthy* and *M. Ramos*, (No. 13128, Herb. Manila); in the Island of Polillo, *McGregor* (male specimen No. 1908, Herb. Manila).

Apparently belonging to *C. filispadix* is a sterile specimen collected by *Merrill* in Palawan No. 7251. "This apparently belongs to a not yet fertile plant; one of the flagella is above 6 m. in length, and the leaf-sheaths are armed with spines up to 5 cm. long and some at the mouth as much as 10 cm.

OBSERVATIONS.—*C. filispadix* greatly resembles *C. Hookerianus* in the extraordinarily elongate spadices, but differs from it in the leaflets which have 3 sharp, distinct, costæ slightly bristly on the upper surface and covered throughout on the lower with numerous fulvous bristles; it differs also in the fruit being ovoid and not spherical, with a more distinctly pedicelliform fruiting perianth, and in the seed longer than broad and not orbicular.

SUPPL. PLATE 15.—Calamus filispadix *Becc.* Sheathed stem with base of a petiole and the lower part of a spadix; intermediate portion of a leaf; an entire partial inflorescence; a detached spikelet with the fruits attached. From Curran's No. 10630 in Manila Herbarium.

54*b*. CALAMUS MELANORHYNCHUS Becc. n. sp.

DESCRIPTION.—High scandent and of middling size. *Sheathed stem* 3·5–4 cm., the canes 2 cm. in diameter. *Leaf-sheaths* strongly gibbous above, thick and woody, very powerfully armed with irregular, horizontal or more or less oblique, incomplete rows of large, thinly laminar, very rigid, spreading, triangular, blackish spines of which the largest are 12–18 mm. long and 8–12 mm. broad at their base; between the rows of these are other rows of smaller spines, but of the same description. *Leaf-sheath* flagella excessively long (about 7 m.—Elmer). *Leaves* (non-cirriferous) about 2 m. long in the pinniferous part; petiole about 25 cm. long, 2 cm. broad at its base, flat and sparsely prickly, especially along the central line, the margins sharp; underneath it is convex and armed with a line of solitary claws along the centre and with several subdigitate divergent blackish spines near the margins; in its lower portion the rachis has the upper surface at first flattish or slightly convex and sprinkled with small erect prickles, and from the middle upwards is bifaced with an acute salient sparingly prickly angle; underneath it is powerfully and densely armed with single claws along the centre and on each side and only near the end the claws become not very regularly ternate. *Leaflets* very numerous, very regularly equidistant, 2·5–3 cm. apart, inserted at an angle of about 45°, papyraceous, rigidulous, almost similarly green on both surfaces, linear-lanceolate, broadest far below the middle and from thence tapering below to a narrow base and above to a long, acuminate, bristly apex; they are conspicuously 3-costulate on the upper surface, the mid-costa is very sharp and smooth, while the side costæ are slender and provided with a few inconspicuous spinules; on the undersurface only the mid-costa is minutely, at times rather closely, hairy-spinulous; transverse veinlets much interrupted; the margins are sometimes slightly thickened by a secondary nerve, which runs along them, and are very inconspicuously spinulous, the spinules being remote, very small and appressed; the intermediate leaflets are 40–45 cm. long, 2 cm. broad; those near the base narrower, but considerably shorter; those of the upper end are gradually reduced in length and breadth, the two of the apex being only 7–8 cm. long and 2–4 mm. broad and quite free from the base. *Male* and *female spadices* flagelliform, excessively long, similar as regard the axial and appendicular parts, with several partial inflorescences about 1 m. apart, and a very long common stalk (1·5 m. long in one specimen) which is very closely sheathed by two

spathes, the lowerst of which is about 40 cm. long and of the uniform thickness of 12 mm., is very slightly flattened with very blunt edges, very obliquely truncate or briefly open at its mouth, where the partial inflorescence arises, and is prolonged above into a rather elongate, lanceolate, dorsally keeled apex: its entire surface is almost smooth on the axial side, and is covered all over on the opposite side with small scattered claws; the second and other spathes are also very closely sheathing, are subterete and sprinkled with minute claws above, and gradually pass below into a thinner very elongate axial part, which is flattish and smooth on the inner side and is very powerfully armed externally with robust claws, more or less confluent in groups of 2–5, but rarely so regularly as to form the usual half whorls. *Male spadix* with the partial inflorescences very elongate and branched again; in one specimen the lowest partial inflorescence is 1·2 m. long and carries about 10 gradually diminishing secondary or spikelet bearing branches on each side; secondary spathes closely sheathing, elongate-infundibuliform, flattened or somewhat concave and with sharp edges on the axial side, obliquely truncate and smooth at the mouth, produced at one side into a long, acuminate, triangular, dorsally keeled apex and sprinkled with very small claws on their upper part; the branches of the partial inflorescences are inserted at a rather acute angle just at the mouths of their respective spathes; the lowest are 20–25 cm. long, and carry 8–10 spikelets on each side; the uppermost are only 10–12 cm. long and with 7–8 more approximate spikelets; spathes of the branches tubular-infundibuliform, flat on the inner side, produced above into a triangular point, slightly prickly or also smooth; spikelets also inserted just at the mouths of their spathes at a rather acute angle, slightly arched: the largest, (the lowest) 3–4 cm. long with 10–12 flowers on each side: the uppermost smaller; the spathels are very approximate, broadly infundibuliform and with their acuminate points suffulting the base of the flowers; involucre hidden within its spathel, dimidiately cupular or like a swallow's nest, lunately excavate and bidentate on the side next to the axis. *Male flowers* ovoid-oblong, bluntish, obsoletely trigonous, 4·5–5 mm. long; the calyx tubular-cyathiform, broadly tridentate; the corolla one-third longer than the calyx. *Female spadix* simply branched; partial inflorescences elongate, strict or with the spikelets erect and very appressed to the straight main axis: the lowest partial inflorescence is (in one specimen) 75 cm. long and carries about 25 gradually diminishing spikelets, which when loaded with fruits cover entirely the main axis and form a long and very strict spike; secondary spathes similar to those of the male partial inflorescences, but somewhat shorter and slightly broader; spikelets inserted at the mouths of their respective spathes and arising erect from these; the lowest, largest, about 10 cm. long, with 18–20 distichally set flowers on each side; spathels broadly infundibuliform, acute at one side; involucrophorum obliquely attached at the base of the spathel above its own, concave, shallow; involucre cupular, rather deep, entire and exactly truncate at the mouth. *Fruiting perianth* not pedicelliform; the calyx split down to the base into 3 ovate segments; the segments of the corolla lanceolate, acute, as long as, but smaller than those of the calyx. *Fruit* globular-ovoid, being slightly longer than broad, surmounted by a relatively conspicuous, broadly conical, blunt, black beak, 13–14 mm. long, inclusive of beak and perianth, and 10 mm. in diameter; scales arranged in 15 longitudinal series, straw coloured with a narrow almost black margin (which is minutely

erosely toothed) all round, narrowly and rather deeply grooved along the centre: their apices slightly produced, bluntish or subacute. *Seed* globular-ovoid, 9 mm. long, 7 mm. broad, with a pitted and sinuously grooved surface; chalazal fovea small, shallow, umbilicate, central; albumen deeply ruminate; embryo basal.

HABITAT.—The Philippines: Island of Mindanao, Todaya (Mt. Apo), District of Davao, at 1200 m. In dense humid forests south of the Sibulan River. Collected by *A. D. E. Elmer* in September 1909 (No. 11708). Native name "Daluuban."

OBSERVATIONS.—It is apparently related to *C. filispadix*, but is quite distinct by its woody leaf-sheaths very powerfully armed with black laminar, triangular spines and by the very elongate spadices, bearing several very elongate partial inflorescences, of which those bearing fruits are very strict, or with the spikelets drawn together round the axis, and by the spherical fruits with a broad blunt black mucro.

SUPPL. PLATE 16.—Calamus melanorhynchus *Becc.* Portion of the sheathed stem; partial inflorescence loaded with fruits; intermediate portion of a leaf. From Elmer's No. 11708 in Herb. Beccari.

55. CALAMUS NEMATOSPADIX Becc.

This species has been collected again in Sarawak (probably by *Hewitt*) according to a specimen in the Herbarium at Kew, which exactly corresponds to the type, only the female spadix appears more robust than that represented in my plate 71 of this volume.

To this species I refer a *Calamus*, preserved in the Buitenzorg Herbarium and collected by *Hallier* in Dutch N. W. Borneo in the Residency of Sambas at Sangouw (No. 874) and at Sungei Sambas (No. 1038). It slightly differs from the type in the leaf-sheaths more densely armed with longer spines (at times as much as 15–20 mm. long); the spines of the newly exposed leaf-sheaths are fringed with furfuraceous scales on the edges, but become glabrous later; the leaflets are spinulous on 3 and at times 5 nerves underneath. The male spadices are extraordinarily slender and long, exactly as in plate 71 of this volume; the partial inflorescences of the female spadix are 50–60 cm. long and have numerous deflexed spikelets which are in every respect exactly as in the type.

55*a*. CALAMUS LAXISSIMUS Ridley, Mat. Fl. Mal. Penin. ii, 210.

DESCRIPTION.—Apparently scandent and slender. *Leaf-sheaths* not seen by me, but probably flagelliferous. *Leaves* non-cirriferous; the upper part of one has the rachis trigonous in section, with a salient, not very sharp smooth angle above, flat and armed with solitary, sharp, short claws on the back; the leaflets apparently are not very numerous, are in rather distant pairs (about 5 cm. apart), the leaflets of one side being exactly opposite to those of the other side, with a distinct axillary callus at their insertion, spreading or even deflexed, very narrowly lanceolate or ensiform, gradually acuminate to a slender and at the sides bristly apex, thinly papyraceous but rather rigid, almost glossy on the upper and dull on the lower surface, otherwise

concolorous, subtricostulate or with the mid-costa acute and a secondary nerve on each side of it stronger than a few other secondary nerves, quite smooth on both surfaces; transverse veinlets very sharp; margins smooth or nearly so; the largest leaflets seen by me, apparently those of the intermediate portion, 38 cm. long, 22–24 mm. broad; the upper ones gradually smaller; those of the terminal pair free from the base, 20 cm. long. 10–12 mm. broad. *Male spadix* elongate, very slender, about 1·5 m. long (in one specimen) with very few, very lax and distant partial inflorescences; the terminal portion bears a few, remote, compound spikelets, not differing from those of the partial inflorescences; the extreme apex is represented by a short (3 mm. long) very slender, unarmed tail-like appendage; the axial basal part is elongate, much flattened, two-edged, armed feebly with slender, horizontal, needle-like spines, the axis between 2 partial inflorescences is filiform, armed with very few, small claws or smooth; primary spathes very long, very narrow, very closely sheathing, strongly flattened and acutely two-edged, especially the lowest, split longitudinally in their upper part and terminating in a narrow acuminate point; they are sprinkled with small, punctiform, brown scales, otherwise are glabrescent like the axial parts; the partial inflorescences are elongate, the largest 40 cm. long, with only 4 compound spikelets on each side and a tail-like very slender appendage at the end as already described; secondary spathes elongate-tubular, very slightly infundibuliform in their upper part, flattened and very slender lower down, produced at the summit into a membranous triangular acuminate point, which subtends its own spikelet; compound spikelets 4–5 cm. apart, inserted just at the mouth of their own spathes, subtended by the point of these and kept horizontal by a distinct axillary callus; they are very slender, 7–11 cm. long and have 15–18 very small, few-flowered, secondary spikelets on each side; primary spathels infundibuliform, puberulous, truncate and ciliate at the mouth; secondary spikelets very short, with only 2–3 very closely packed flowers on each side; spathels inconspicuous, bracteiform; involucre very shallowly cupular bidentate. *Male flowers* subterete, 3·5–4 mm. long, obscurely apiculate; the calyx cylindrical, shortly 3–dentate, not or obsoletely striately veined; the corolla polished externally, about twice as long as the calyx. Other parts not seen by me.

Habitat.—The Malayan Peninsula: Pahan, Tahan River, *Ridley*, (Herb. Beccari).

OBSERVATIONS.—I have seen of this a specimen kindly given to me by Mr. Ridley. IT belongs to the group V, and is apparently rather closely related to *C. nematospadix*, but it is very easily recognizable by its remote, exactly opposite leaflets kept divaricate, and at times even deflexed, by an axillary callus; and by the very lax, elongate, almost unarmed male spadix with elongate, slender compound spikelets, which bear many secondary, very small, very few-flowered, secondary spikelets.

Ridley describes the lowest spathe as being 9 inches long with a lanceolate, thin limb, and its mouth armed with erect, slender processes an inch long.

17. SUPPL. PLATE 17.—Calamus laxissimus *Ridley*. Upper end of a leaf; an almost entire male spadix. From the specimen in Herb. Beccari.

64. CALAMUS LURIDUS Becc. Add:—Ridley, Mal. Fl. Mal. Penins. ii, 198.

Ridley gives several localities for this species, but some of these, apparently belong to allied species.

In fact I have identified as *C. scabridulus* No. 11300 from Sungei Semangat, sent to me by Ridley himself. Probably also the Rawang plant which is said to have the leafsheaths with transverse ridges, like those of *C. rugosus*, belongs to a species different from *C. luridus*, According to Ridley *C. luridus* grows also in Borneo, but I have not seen specimens of it from that country.

64*a*. CALAMUS PULAIENSIS Becc. n. sp.

DESCRIPTION.—Apparently scandent and rather slender. *Sheathed stem* . . . *Leaf-sheaths* not seen by me, but almost certainly flagelliferous. *Leaves* 60 cm. long in the pinniferous part (non-cirriferous); petiole 14 cm. long (in one leaf), 8 mm. broad at its base, convex and smooth on the back, flattish on the upper surface, the margins not very acute, armed with short, 1–4 mm. long, slender, straight, horizontal spines; rachis glabrous, bifaced and with an acute smooth salient angle above, rather feebly armed underneath with a single line of very small, rather close, black tipped claws; leaflets about 30 on each side, equidistant, closely set (12–15 mm. apart), thinly papyraceous, subconcolorous on both surfaces, linear-lanceolate, tapering at the base, subulately acuminate, faintly 3–costulate; on the upper surface the side costæ are slender, finely and rather closely spinulous, and the mid-costa is sharp and sparingly spinulous only near its apex; underneath the 3 costæ are not prominent, but when seen under a strong lens appear covered with exceedingly minute hairs; sometimes some of the secondary nerves are also similarly hairy; transverse veinlets rather distant, sharp, sinuous, much interrupted; margins very minutely, closely, and appressedly ciliolate, the cilia ultimately deciduous when the margins appear only minutely scabrid; the intermediate leaflets are 17–19 cm. long and 12 mm, broad in their central part; the lowest are narrower and slightly shorter, those near the summit suddenly smaller; the two of the terminal pair are the smallest and free at their bases. *Male spadix* . . . . *Female spadix* simply decompound, rigid and straight, one specimen has only 4 partial inflorescences, is about 1 m. long including a slender, rigid, apical, 30 cm. long flagellum; primary spathes very closely sheathing, narrow and elongate; the lowest 17 cm. long, flattened, plano-convex in their basal part, biconvex above, acutely two-edged, smooth on the axial side, armed externally with small subtuberculiform claws, especially on their lower slightly attenuated part, and with a very short triangular entire limb at their upper end; partial inflorescences 12–15 cm. apart, erecto-patent, inserted a little above the mouth of their respective spathes with a not very strong axillary callus; they are 18–20 cm. long, and carry 6–7 spikelets on each side; secondary spathes elongate-infundibuliform or subclavate, smooth (not striated) and unarmed, sprinkled with small appressed rubiginose scales, truncate and entire at the mouth, slightly produced at one side into a short point; spikelets rigid, spreading, inserted just at the mouth of their respective spathes with a distinct axillary callus: the lower and largest are 4–4·5 cm. long, have 11–12 bifarious approximate flowers on each side: the upper ones somewhat shorter; spathels very short and very broadly infundibuliform, obsoletely veined and more or less scabrid-furfuraceous, very slightly produced at one side into a short acute point; involucrophorum cupular, almost at a level with its own spathel, with an irregular margin usually with two more or less distinct teeth on the side of the neuter

flower, of which the areola is distinctly lunate, sharply edged and callous in its centre. *Female flowers* 4–4·5 mm. long; the calyx shortly cylindraceous with a callous and flat base, smooth outside, divided down about to the middle into 3 broadly triangular lobes; the corolla about twice as long as the calyx, its segments lanceolate, acute, smooth outside. The growing ovaries are elongated into a thick style, which terminates in 3 relatively large, acute, internally lamellose recurved stigmas. *Fruit* . . . . .

HABITAT.—The Malayan Peninsula. A species apparently very localized, discovered by *Ridley* in January 1904 on Gunong Pulai, in the State of Johore. (No. 12199 in Kew Herbarium).

OBSERVATIONS.—I have seen of this species only a leaf and an entire female spadix, with flowers spent and with growing ovaries.

It is apparently related to *C. luridus*, with which it partakes the not very common character of the corolla of the female flower being twice as long as the calyx; it differs chiefly in the leaves, which possess more numerous, more approximate, but narrower, and less distinctly 3-costulate leaflets. Its diagnostic characters are: the (non-cirriferous) leaves with numerous, equidistant, linear-lanceolate, obscurely 3-costulate leaflets, with minute spinules on the side costæ above, and with very small hairs on the 3 costæ beneath; the rachis armed beneath with a line of single claws; the female spadix rigid, relatively not very long, shortly flagelliferous at its apex, and with few rigid, 18—20 cm. long, partial inflorescences; the spikelets 3–4·5 cm. long, rigid, having closely-set bifarious flowers; the female flowers with an almost cylindrical calyx, smooth outside, truncate and callous at the base; the corolla twice as long as the calyx, its segments lanceolate and acute; the ovary tapering to a relatively thick and large style, and with acute, recurved stigmas.

SUPPL. PLATE 18.—Calamus pulaiensis *Becc.* An entire leaf; the female spadix with growing ovaries. From Ridley's No. 12199 in Kew Herbarium.

68*a*. CALAMUS PILOSISSIMUS.—Becc. in Résul. Exp. Sc. N. Guineé (Bot.) viii, 219.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* 5-6 mm. in diameter. *Leaf-sheaths* bearing by turns spadices and flagella, thinly furfuraceous, when young very slightly gibbous above, sharply longitudinally striate, armed throughout with small, very slender, scattered ascendant, 2–5 mm. long, acicular spines; near the mouth the spines are more numerous and almost bristly and 10—20 mm. long or less. *Ocrea* short, exsuccous, brittle, deciduous. *Leaf-sheath flagella* filiform, flattened in their lower part, densely armed all round in their very slender apical portion with excessively small solitary scattered claws. *Leaves* non-cirriferous, very regularly pinnate; those of the lower part of the stem or of the young plants furnished with a elongate petiole and about 50 cm. long in the pinniferous part; those of the upper part of the florigenous stems much shorter, about 30 cm. long and without a petiole; rachis flattish and puberulous underneath, bifaced above and bristly on the salient angle; the rachis of the radical leaves is unarmed underneath, that of the upper leaves is armed at regular distances in its lower part, or even throughout to the apex, with very small, gradually diminishing claws; leaflets numerous, 35 on each side, regularly pectinate and equidistant, approximate (5–7 mm. apart) linear-lanceolate; they

taper somewhat towards a rather acute base and from the middle upwards are gradually acuminate to a setiform tip; are thinly papyraceous, green and subconcolorous on both surfaces, subtricostulate, or with the mid-costa very sharp and another costa more slender on each side of it; all 3 furnished with long bristles on their upper surface, and quite smooth underneath; secondary nerves extremely slender or inconspicuous; transverse veinlets rather sharp, distant, connecting the costæ; margins sharp, furnished with numerous, long, light coloured, soft and very delicate, conspicuous cilia as much as 5–7 mm. long; the largest leaflets are those of the middle, which are in the upper leaves 10–12 cm. in length and 5–8 mm. in width, and in the radical ones 15–17 cm. by 7–9 mm.; the upper and lower leaflets are gradually smaller, those near the mouth of the sheaths being only 3–5 cm. long and 3–4 mm. broad: the two of the terminal pair are quite free at the base, 6–7 cm. long and very narrow. *Male spadix* slender, about 3 mm. thick in its lower sheathed part, flagelliform but rather rigid and terminating in a short, slender, aculeolate appendix; on the whole it is 60–70 cm. long, simple-decompound, has 4–5 not very approximate, gradually diminishing partial inflorescences; primary spathes tubular, very narrow, very closely sheathing: the two lowest very long and similar, slightly flattened, entire and obliquely truncate at the mouth, armed all round with very small solitary scattered claws; partial inflorescences panicled, inserted near or a little above the mouth of their own spathe, slightly arched and spreading: the largest, lowest, is 10–13 cm. long and has 8–10 alternate and bifarious, slightly arched spikelets on each side: the upper ones are gradually shorter and have fewer spikelets; secondary spathes tubular-infundibuliform, glabrous, entire, and almost horizontally truncate at the mouth, flat on the inner or axial side, convex and rather densely armed with small claws externally, strongly striately veined; spikelets inserted just at the mouth of their own spathe, spreading, flattened, with a slender axis, glabrous in every part: the largest, lowest, are 2·5–3 cm. long, and have 10–12 flowers on each side: the others are gradually shorter and have fewer flowers; spathels broadly and obliquely infundibuliform, truncate, entire and glabrous at the mouth, produced externally into a triangular acute point, very strongly striately-veined; involucre cupular, obliquely inserted at the base of the spathel above its own into which it is half immersed, obsoletely bidentate on the side next to the axis. *Male flowers* perfectly bifarious, inserted at an angle of 45°, not in contact with one another, glabrous, ovoid-oblong, obsoletely trigonous and obtusely subapiculate when not yet open; calyx cupular, subcyathiform, strongly striately veined, deeply parted into 3 broadly triangular acute lobes; the corolla striate, twice as long as the calyx.

HABITAT.—In the forests, at about 900 m. above the level of the sea along the Noord-river in the south part of Dutch New-Guinea, collected by Dr. *G. Versteeg* the 9th September 1908 (No. 1701 in the Utrecht Herbarium; collected again during Dr. Lorentz's expedition in 1909 by M. *Von Romer* on Mount Hellwig, between 1350 to 1600 m. above the level of the sea.

OBSERVATIONS.—This is a very characteristic delicate species easily distinguishable from any other known to me by the leaves of the upper part of the plant having no petiole and having many very regularly set leaflets, which bear on 3 nerves above and on the margins very long soft bristles far longer than those of *C. ciliaris*,

which it somewhat resembles. Its position remains somewhat uncertain, but probably its true affinities are with the species of group V.

I consider as referable to *C. pilosissimus* the upper end of a fruiting spadix collected by M. von Römer (No. 1146) during Dr. Lorentz's expedition (1909) in South Dutch New-Guinea, between 1350–1600 m. above the level of the sea on Mt. Hellwig, which is about in the same region whence came the type specimens of *C. pilosissimus* collected by *Versteeg*. The identification is rendered more probable by the fact that in the same locality M. von Römer has collected a leaf (No. 1194) undoubtedly belonging to this species.

The *female spadix* is evidently flagelliform and very slender, at least in its upper part, and terminates in a filiform flagellum armed with solitary scattered claws; the spaces between the partial inflorescences are elongate and also armed with solitary scattered claws and covered with a thin rusty scurf; primary spathes tubular, very narrow, closely sheathing, produced beyond the insertion of their respective partial inflorescences into an acuminate marcescent limb. Of the two partial inflorescences present in the specimen seen by me the uppermost is composed of a single spikelet, the other is very short and has 4 spikelets, two on each side, and ends in a short tail-like appendage; the secondary spathes are infundibuliform and of a firm texture in their lower part and are produced above far beyond the insertion of their respective spikelets into an elongate marcescent limb. Spikelets short, about 3 cm. long, thickish and with only 6–7 closely packed flowers in all; spathels, approximate, infundibuliform, truncate at the mouth, strongly striately veined; involucrophorum hidden in its spathel; involucre concave, broadly subcyathiform irregularly lobately split, areola of the neuter flower depressedly lunate. The *female flowers* may be judged from the fruiting perianth about 7 mm. long. *Fruiting perianth* explanate; the calyx split down almost to the base into 3 ovate lobes; the divisions of the corolla acuminate, slightly longer but narrower than the lobes of the calyx; spathels, involucres, calyx and corolla strongly striately veined and more or less permanently scaly furfuraceous. *Fruits* crowded into a group upon the spikelets, very regularly ovoid-elliptical, equally rounded at both ends, very suddenly terminating in a slender, subterete, about 3 mm. long mucro; 22–25 mm. long, inclusive of the beak and perianth, and 15 mm. broad; scales very numerous, arranged in 21-22 longitudinal series; about 12 well conformed, may be counted in each series; they are of a reddish brown colour on the anticous part and pass into greenish yellow posticously; the apex is slightly produced, triangular, bluntish; they are narrowly but rather deeply grooved along the centre, the grooves being continuous from one scale to another, so that the entire fruit appears marked with as many longitudinal grooves as there are longitudinal series of scales. *Seed* oblong, slightly broader than thick, 15–18 mm. long, 11–12 mm. broad, 8·5–9 mm. thick, marked above the middle on the raphal side by a deep round chalazal fovea, rounded at both ends, covered with a thin not easily removable (in the dry condition) integument: when cleansed from this the surface is even and polished, spadiceous; albumen equable; embryo exactly basal.

The leaf mentioned above (No. 1194) is apparently from the lower part of the plant; it is larger than those figured in supplementay plate 19, and, although wanting its basal part bears, on a portion of rachis 45 cm. in length, about 50

leaflets on each side, of which the lowest are 16–17 cm. long, and 8 mm. broad, very spreading or almost horizontal; otherwise this leaf corresponds in every respect to those of the type (Versteeg No. 1701).

SUPPL. PLATE 19.—Calamus pilosissimus *Becc.* Upper end of a plant with a male spadix; another leaf with a male spadix attached to its leaf-sheath. From Versteeg No. 1701 in the Herbarium at Utrecht.

SUPPL. PLATE 20.—Calamus pilosissimus *Becc.* Spadix bearing fruits representing the entire von Römer's specimen No. 1146 in the Herbarium at Utrecht.

69. CALAMUS MYRIACANTHUS Becc.

This is another of the new species of *Calamus* already described by me in this volume which has been found again in Sarawak. I have seen a specimen with a male spadix collected, apparently by *Hewitt*, at Siul (Seoul) in September 1905, and forwarded from the Sarawak Museum to the Herbarium at Kew.

The *male spadix* is ultradecompound, slender but not flagelliform, composed of several partial inflorescences and ending in a very slender tail-like unarmed appendage; the partial inflorescences are considerably apart, elongate, and slender, spreading and arched, and carry compound spikelets in their lower part, and simple spikelets towards the apex; the lowest primary spathe is strongly flattened, sharply two-edged, closely sheathing and ends in a narrow auriculiform acuminate limb; secondary spathes tubular, more or less rusty furfuraceous, unarmed; secondary spikelets very short. *Male flowers* terete, acute, 5 mm. long and 1·3 mm. broad; the calyx tubular, 3-toothed, of hard texture, callous at its base, not or very obsoletely striately veined; the corolla one and-a-half time longer than the calyx, its divisions linear, acute, polished externally; the lowest primary or compound spikelets are 5–8 cm. long, and carry numerous (10–14 on each side) secondary simple very short spikelets, of which the lower, largest, are 4–6 cm. long and carry only 4–5 flowers on each side; upper spikelets gradually smaller, and with fewer flowers; spathes of the compound spikelets infundibuliform, rusty puberulous-furfuraceous; spathels concave, bracteiform, acute, strongly striately veined; involucre slightly concave, strongly striately veined, considerably broader than high, and as if formed by two triangular acuminate bracts united by their bases.

70. CALAMUS PYGMAEUS Becc.

OBSERVATIONS.—It has been collected again in Borneo on Mount Mattang by *Ridley* (No. 12397) and by *Hewitt* (Herb. Kew.), and seems a rather common plant. All these specimens are more robust than the type figured in plate 86, have a stem 15–20 cm. long and 15 mm. in diameter, when covered by the sheaths; the leaves are also larger, 70–90 cm. long, have the rachis armed on the back in its lower part with small solitary claws, and smooth from the middle upwards or only near the apex; there are 25 leaflets on each side, of which the largest are 20–22 cm. long, 13–14 mm. broad. In Hewitt's specimens the short sheathed stem is 2 cm. in diameter; the leaf-sheaths are armed with small, laminar, triangular, deflexed, furfuraceous spines; one leaf is 75 cm. long and the leaflets as above described; the male spadix is flagelliform like the female, its spikelets are short, 10–15 mm. long, and have only 3–4 rather distant flowers on

each side; the axes of the spikelets are zig-zag sinuous; the spathels are tubular-infundibuliform, truncate; involucre cupular, truncate, not or slightly protruding beyond the mouth of its spathel. Sometimes the long filiform spadices are viviparous or produce rooting leafy buds from the axils of the upper primary spathes.

73. CALAMUS RALUMENSIS Warb.

OBSERVATIONS.—Prof. Udo Dammer forwarded to me in October 1905 a fruiting branchlet of this species, collected in Garowe Insel (=Deslacs Insel) and presented to the Herbarium at Berlin by the "Neu Guinea Companie." The fruits, almost completely ripe, are spherical, 9 mm. in diameter, slightly smaller than those of Lauterbach's No. 2814 in the Berlin Herbarium.

A more slender form of this species has been collected by Missionary Peekel (No. 80 Herb. Berol.) in Neu—Pommern (German New Guinea) at Namatanai near Herbertshöhe. The sheathed stem is 14–15 mm. in diameter, and the leaf-sheaths are armed with short, broad-based, scattered, horizontal prickles; leaves about 50 cm. long. Other specimens also collected by Missionary Peekel at Namatanai in New Mecklenburg (German New Guinea) (Nos. 439, 440, 441 in Herb. Berol.) have leaves 1·10–1·30 m. long, oval in outline; the leaflets towards the lower third part of the rachis being the largest, 35–40 cm. long, 25–28 mm. broad. those of the middle somewhat shorter but not narrower; from the middle upwards they speedily decrease in length and slightly in width; the two uppermost are free at the base, 15 cm. long, 10–15 mm. broad and have a very fine filament between them; the lowest are narrower, more approximate, horizontal or also deflexed. The leaf-sheath flagella are long and slender, uninterruptedly very closely armed with scattered or more or less confluent but not regularly whorled claws. A *female spadix* with immature fruits measures about 2 m. in length from the base to the uppermost partial inflorescence and terminates in a slender irregularly clawed flagellum, another metre long; the partial inflorescences, in one specimen, are 9, gradually decreasing: the intermediate appear the largest, about 50 cm. long and carry 10–12 strongly curved spikelets on each side; occasionally the lowest spikelets are branched from the base. Every part of the spadix, and the fruits also, acquire a light-straw colour in herbarium specimens.

76. CALAMUS TENUIS Roxb.—Add:—Strachey and Duthie Cat. Pl. Kumaon, 194; Prain in Rec. Bot. Surv. Ind. iii, (1905), 291.

Add to localities: Bhábar (1,000 ft.) ex Strachey and Duthie; Sundribuns, vernacular "Sanchi bet," ex. Prain l. c.

77. CALAMUS HORRENS Bl.

Add to localities:—collected with fruits in Java by *Koorders* (No. 21698β, No. 21696β, at Puger-Watangan, Residency of Besuki, and with male spadices by *C. A. Backer* near Batavia at Pepango; also at Palabuan, Residency Preanger, *Koorders* No. 34588β, (all specimens in the Buitenzorg Herbarium.)

OBSERVATIONS.—The male flowers and the fruits do not differ from those of *C. tenuis*, of which *C. horrens* is, apparently, only a geographical form and to which it must be, I think, specifically reduced.

78. CALAMUS GODEFROYI Becc. Add:—Becc. in Webbia di U. Mart. iii, (1910) 242, and in Bull. Mus. Hist. Nat. (1911), 13.

This species described from very incomplete specimens collected in 1879 by *Godefroy-Leboeuf* was previously gathered by Dr. *Thorel* at Hong Kay in Cochin-China, during the Mekong expedition 1866–68 according to some specimens with female spadices in flower preserved in the Paris Herbarium. These specimens are only more slender than the type figured in plate 96. The *sheathed stem* is 8–9 mm. in diameter. The *leaves* are 40–45 cm. long, and as in the type have no petiole, and very inequidistant leaflets; the latter are frequently furnished with the characteristic spinules on the upper surface near the base of the mid-costa; the spadix is also shorter than in the type specimen; the female flowers are 3 mm. long, have a flat callous base and are conical acute, at times more or less angular; the calyx is very briefly 3-toothed; the corolla very slightly longer than the calyx; the neuter flowers are rather conspicuous, slender, linear, 3–5 mm. long, have the calyx acutely 3-toothed and the corolla about twice as long as the calyx. *C. Godefroyi* seems more closely related to *C. tenuis* than to *C. Rotang*, from which it is at once distinguished by its leaves having very inequidistant leaflets.

79. CALAMUS ROTANG Linn. Add:—Cooke Fl. Bom. ii, 807.
Rotang Linnaei Baill. Hist. des Pl. xiii, 326.

"Sometimes grown in gardens, but not indigenous in the Bombay Presidency When young it is a very graceful plant with pinnate leaves 1–2 ft. long and with black spines ½ in. long on the stem and leaf sheaths, but when it attains a height of 5–6 feet and develops its whip-like flagella armed with numerous sharp recurved thorns it is generally considered time to cut it down." Cooke l. c.

82. CALAMUS TONKINENSIS Becc. Add:—Becc. in Webbia di U. Mart. iii, (1910) 242, and in Bull. Mus. Hist. Nat. (1911), 148.

OBSERVATIONS.—This species seems more closely related to *C. tenuis* than to *C viminalis (fasciculatus)* with which I had compared it.

83. CALAMUS DELESSERTIANUS Becc.

OBSERVATIONS.—This species apparently must be suppressed, as it seems to me now that the specimens with female flowers represented in plate 101, upon which the species was established, represent only parts of a luxuriant form of *C. tenuis* Roxb.

85. CALAMUS SALICIFOLIUS Becc. Add:—Becc. in Webbia di U. Mart. iii, (1910), 242 and in Bull. Mus. Hist. Nat. (1911), 160.

86*a*. CALAMUS CAMBOJENSIS Becc. in Webbia di U. Mart. iii, 232, and in Bull. Mus. Hist. Nat. (1911), 160.

Description.—Apparently scandent or subscandent?, very slender. *Sheathed stem* 6–8 mm. in diameter. *Leaf-sheaths* not or very obsoletely gibbous above, at times flagelliferous, armed with very unequal, scattered, light coloured spines, of which some are very short or tuberculiform and others 5–10 mm. long, slender yet very rigid and slightly deflexed. *Ocrea* very short, membranous, truncate. *Leaves* short, 35 cm. long non-cirriferous), with very few leaflets (12–14 in all), approximate into 3–4 distant groups; petiole short, 1·5–3 cm. long, the edges acute, prickly, concave on the upper surface, convex and almost smooth or more or less prickly on the back; rachis angular, armed on the lower surface with small, solitary and very irregularly scattered claws; leaflets approximate in pairs on each side of the rachis, the pairs of one side usually opposite to those of the other side; the two leaflets of the apex are connate in their basal part or up to about the middle; all leaflets are exactly elliptical-lanceolate or narrowly elliptical, taper equally to both ends, have the base acute and the apex briefly acuminate and bristly, are membranous or thinly papyraceous, light green when dry, slightly paler on the lower than on the upper surface, are obsoletely 5-costulate, but the mid-costa alone is very sharp, although slender, the other costae are excessively fine, all are quite smooth on both surfaces, or occasionally the mid-costa alone has a straggling spinule on the upper; transverse veinlets extremely numerous, approximate and continuous, especially conspicuous and sharp on the upper surface; margins ciliate with small spreading spinules; the leaflets of the intermediate group are 10–11 cm. long, 2-3 cm. broad or at times less; the 3–4 leaflets of the apical group are slightly shorter, but not narrower; those near the base are usually the smallest. *Male spadix* ...... *Female spadix* flagelliform, very slender and flaccid, simply branched, longer than the leaves inserted near the mouth of the leaf-sheaths with a distinct axillary callus, 0·8–1 m. long, inclusive of an excessively slender, 5–8 cm. long, aculeolate, terminal appendage, they have very few (3–4) distant, simple, partial inflorescences; primary spathes tubular, all very narrow, 2–3 mm. in diameter, very closely sheathing, entire and truncate at the mouth, slightly produced into a brief triangular acute point, more or less sparsely armed with small claws: the lowest shorter than the following, 8–10 cm. long and only very slightly broader than the upper, flattened and two-edged in its lower part, the edges more or less prickly; partial inflorescences inserted above the mouth of their respective spathe with a conspicuous axillary callus, flaccid and with a slender axis: the lowest (largest) is 15–20 cm. long, or at times more, and bears distichally 5–7 alternate, curved and deflexed spikelets on each side; secondary spathes 1–2 cm. long, tubular, very narrowly infundibuliform and with a slender flattened base, unarmed, obliquely truncate and ciliate at the mouth, slightly produced at the apex into a triangular acute point; spikelets inserted at the mouth of their respective spathes with a distinct axillary callus, 2–3·5 cm. long; their axes are subterete, 1–5 mm thick, and carry distichally 5–8 not very approximate flowers (female on each side; spathels rather broadly infundibuliform, striately veined, truncate at the mouth, briefly produced at one side into a broad, triangular, acute point; involucrophorum concave, attached laterally to the base of the spathel above its own; involucre suborbicular, shallowly cupular; areola of the neuter flower lunate, flat, sharply edged. *Female flowers* ovoid; the calyx finely striately veined. *Neuter flowers* conspicuous, very similar to the female and only slightly smaller. Other parts unknown.

HABITAT.—Indo-China: Cambodja; the specimens in the Herbarium at Paris were collected by M. *Gourgaud* and sent to the "Exposition coloniale de Marseille" of 1906; the precise locality is not given. Native name "Phdau Sau."

OBSERVATIONS.—It seems to approach *C. tetradactylus* in the leaves and in the disposition of its leaflets, but it has a more slender and flaccid spadix with narrower, longer and more closely sheathing spathes.

SUPPL. PLATE 21. Calamus cambojensis *Becc.* Upper end of a plant with a female spadix in flower. From Gourgaud's specimen in the Herbarium at Paris.

86*b*. CALAMUS BONIANUS Becc. in Webbia di U. Martelli, iii, 231, 213 and in Bull. Mus. Hist. Nat. (1911), 160.

DESCRIPTION.—Apparently slender, high scandent (Bon). *Sheathed stem* probably as thick as a man's finger. *Leaf-sheaths* unknown, but almost certainly flagelliferous. *Leaves* (non-cirriferous) small, 48–55 cm. long (in two specimens); petiole short (4–6 cm. long), flat on the upper surface, its margins acute and irregularly armed with a few, straight, horizontal spines, convex and smooth, or nearly so, underneath; rachis bifaced on the upper surface, more or less convex on the back, where irregularly armed with unequal, solitary, scattered claws, of which some have a long and suddenly deflexed point; leaflets 20–27 in all, distinctly approximate in 6–7 groups of 2–3 on each side, with interposed vacant spaces 4–10 cm. long: the groups of one side opposite to those of the other side; the leaflets are radiately divaricate in each group or point in different directions, are lanceolate or elliptical lanceolate or oblanceolate, 12–20 cm. long, 2–3 cm. broad, broadest about the middle or above, shortly and sometimes rather abruptly acuminate to the apex, and narrowing lower down to a rather acute base: are thinly papyraceous, subconcolorous, slightly paler underneath, have 3–5 and at times 7, very slender costae; the midcosta is slightly stronger than the others and sometimes sparingly spinulous on the upper surface, otherwise all nerves are smooth all over; transverse veinlets sharp and very close together; margins spreadingly ciliate-spinulous; the two terminal leaflets united about half way up. *Male spadix* apparently elongate, (not seen entire) ultradecompound; secondary branchlets 7–8 cm. long, with 5–7 spikelets on each side; the spikelets recurved, arched-subscorpioid, 1–2 cm. long, their axes filiform, very slender; the largest spikelets (the lowest) have 15–16 flowers in all, which are bifarious but not flatly, so more or less point upwards; spathels cylindraceous and tubular in their lower part, abruptly broadening into a relatively large, infundibuliform limb which is strongly striately veined and produced at one side into an acuminate point; involucre sub-bracteiform, slightly concave, 3-lobed, the lobes acute, striately veined. *Male flowers* 3·5 mm. long, 1·5 mm. broad, narrowly ovoid-elliptical, acute; the calyx cupular-campanulate, rounded at the base, strongly striately veined, divided down to about the middle into three triangular acute lobes; the corolla (in full grown flowers) a little more than twice as long as the calyx, its segments lanceolate, apiculate, finely striolate. *Female spadix* decompound, elongate, 1·50 m. long (in one specimen) including a slender 50 cm. long, aculeolate, terminal flagellum: it has a strong axillary callus at its insertion and carries eight partial

inflorescences; primary spathes thinly coriaceous or subpergamentaceous, tubular, tapering towards the base, and somewhat enlarged, and rather loosely sheathing upwards, smooth or sparingly armed with small claws, open on one side only near the apex, which is broadly triangular and acute; the lowest or first spathe narrowly two-keeled; partial inflorescences inserted somewhat below the mouth of their spathe, ascendent at first and when outside their spathe arched and recurved: the lower are 10—20 cm. long, and have 12–15 spikelets on each side: the upper are shorter and have fewer spikelets; secondary spathes tubular, not very distinctly striolate, somewhat broadening in their upper part into an infundibuliform limb, truncate at the mouth and produced at one side into a triangular acute or acuminate point which spreads under the base of its own spikelet; spikelets inserted just outside the mouth of their spathes, with a distinct axillary callus, arched, very spreading or deflexed, their axes slender but rigid: the largest the lowest) 6–8 cm. long with as many as 16 flowers on each side: the others gradually shorter and with fewer flowers; spathels similar to the secondary spathes but shorter; involucrophorum orbicular, disciform, flat, sessile with a sign of an axillary callus; involucre discoid, flattish, orbicular, with the edge unequal and the central scar tumescent; areola of the neuter flower callous, punctiform. *Fruiting perianth* distinctly pedicelliform, the calyx cylindraceous and callous at the base. *Fruit* (when not quite mature) 4 mm. in diameter, spherical, distinctly beaked; scales in 21 series, light straw-coloured with a reddish point, rather glossy, slightly grooved along the centre; the margins and point erosely toothed. *Seed* not seen mature.

HABITAT.—Western Tonkin: Yên Cu, *Père Bon* No. 1211 (fruit) and Tai kêuh No. 3549 (male spadix), in the de Candolle and Paris Herbaria. Vernacular name "Cây Mai"

OBSERVATIONS.—Very closely allied to *C. tetradactylus* Hance, of which perhaps it is a local form, but at present, it is difficult to make a rigorous comparison of the two, the fruit of *C. Bonianus* being known only in the young stage. It seems, however, distinct from *C. tetradactylus* by the denser partial inflorescences, with more spikelets and these with more flowers; by the involucrophorum which is sessile, not pedicellate and possibly also by the smaller fruit. The male flowers of *C. Bonianus* are very similar to those of a specimen collected by Henry in Hainan bearing the No. 8213 in the Berlin Herbarium, identified by myself with *C. tetradactylus*.

SUPPL. PLATE 22.—Calamus Bonianus *Becc.* Upper portion of a leaf; upper end of a fruiting spadix (from Père Bon's No. 1211); two secondary branchlets with male flowers (from Père Bon's No. 3549). Both specimens in the Herbarium de Candolle.

87 a. CALAMUS POENSIS Becc. n. sp.

DESCRIPTION.—Rather slender. *Sheathed stem* 15 mm. in diameter. *Leaf-sheaths* flagelliferous (in the terminal and young part of the flowering plant) variegated with glabrous and yellowish and rusty-furfuraceous patches, armed with scattered,

rather strong spines which are slightly deflexed, yellowish, rather short (6–12 mm. long) and have a thickish, 3–5 mm. broad base. *Ocrea* liguliform, rather conspicuous, membranous, exsuccous, glabrous, entire. *Leaves* non-cirriferous, with leaflets conspicuously approximate into 4 distant groups, 60 cm. long in the pinniferous part; petiole about 16 cm. long, subbiconvex, 7 mm. broad, somewhat thickened in its basal part, armed on the margins especially near its base with horizontal, rather robust, straight, unequal, 10–20 mm. long spines, smooth and polished on the back, and with short erect prickles on the upper surface; rachis quite unarmed, trigonous, polished beneath with an acute salient angle above and flat side faces; the leaflets are very spreading or almost horizontal (all in one plane), very approximate by their bases in each group; the groups are 10–12 cm. or less apart and are formed by 4–8 leaflets on the whole or by 2–4 opposite leaflets on each side of the rachis; those of the terminal group (in one specimen) are seven in number, radiately digitate and uniform; they are all distinctly callous at their insertion in the axillas and in the small basal cavities on the outer surface; they are very elongate or very narrowly lanceolate, broadest about their middle and thence gradually acuminate above to a bristly tip; lower down they taper to a not very acute base; all are about of one size, the mesials slightly the largest, 30–35 cm. long, 18–20 mm. broad, almost glossy above, dull and slightly paler beneath, unicostate; the costa has a few bristles near the apex, the other nerves smooth on both surfaces; transverse veinlets numerous, much interrupted, conspicuously prominent on the upper surface; margins minutely and appressedly spinulous. *Male spadix* simply branched, very slender and long, flagelliform, 2·3 m. long, inclusive of a filiform, finely clawed flagellum; it has very few (4, very distant, partial inflorescences; lowest primary spathe much flattened, spinescent on the rather acute edges; upper primary spathes very long, cylindricous, very closely sheathing, entire, open only at the upper end, where they terminate in a very short obtuse point clawed externally in their basal attenuated part, otherwise smooth; the partial inflorescences are very simple, 15–20 cm. long, have their axial parts slender, filiform and bear alternately 4–6 spikelets on each side; secondary spathes very narrowly-tubular, very closely sheathing, slightly enlarged above; the lowest is 2·5 cm. long, the others are gradually smaller, smooth, glabrous, obliquely truncate and entire at the mouth, slightly prolonged at one side into a short triangular acute point; the spikelets are inserted at the mouth of their respective spathes with an axillary callus, very spreading, arched or recurved, have a slender axis, are 2–2·5 cm. long and bear 8–10 distichous horizontal flowers on each side; spathes very shortly and broadly infundibuliform, produced at one side into a triangular acute point; involucre forming a shallow orbicular cupula. *Flowers* . . . *Female spadix* . . . *Fruit* . . .

HABITAT.—N.-W. Borneo in Sarawak on the top of Mount Poe (1,700 m.), collected by *F. W. Foxworthy* in 1908 (No. 396 in the Manila Herbarium). Dayak name "Rotang Tinkas."

OBSERVATIONS.—A species marked very distinctly among those of group V, to which it belongs, by its leaves having very distinctly grouped leaflets, resembling much the leaves of *C. gracilis;* by the quite unarmed trigonus rachis, and by its very slender male spadices, simply decompound, and with very few, very simple, distant, partial inflorescences.

SUPPL. PLATE 23.– Calamus poensis *Becc.* Upper end of a plant with an entire male spadix; terminal portion of a leaf. The type specimen, Foxworthy No. 396, in the Herbarium at Manila.

88. CALAMUS FEANUS Becc.

OBSERVATIONS.—This species was known only from Sig. Fea's specimens, but I have now had the opportunity of examining other specimens with mature fruits, sent to me by Mr. I. H. Burkill which were collected in 1903 at "Thangyan, in Tenasserim, Burma (Herb. Reporter on Economic Products to the Government of India, No. 21007). The *fruits* are slightly larger than those already described, regularly ovoid, 22–23 mm. long (including the perianth) and 17 mm. broad; the scales are peculiar, being pulverulent and dull in their posticous part and brown alutaceous in the remainder. *Seed* 15 mm. long, 9·5–10 mm. broad, 7–8 mm. thick.

89. CALAMUS BACULARIS Becc.

OBSERVATIONS.—I have seen another specimen of this species in the Herbarium at Kew coming from the Sarawak Museum and labelled: Sk. Bongsitu 800 ft. Coll. G. D. H. As this specimen bears some fruits still attached to the spikelets, I am able to confirm entirely what I have said about them in my description on page 289.

89a. CALAMUS HEWITTIANUS Becc. sp. n.

DESCRIPTION.—Apparently not scandent. *Sheathed stem* 2 cm. in diameter. *Leaf-sheaths* thickish, woody, passing gradually into the petiole, open longitudinally on the ventral side, armed with more or less regularly seriate, rather large (2 cm. long), elongate-triangular, laminar, cinnamon-brown spines, which leave deeply stamped their outline on the surface of the sheaths above them. *Ocrea* liguliform, short, fringed with rigid bristles. *Leaves* not cirriferous, large, about 2 m. long on the whole, the petiolar part alone is 45 cm. long, 10–11 mm. broad, robust and rigid, slightly concave and smooth on the upper surface, on the lower surface convex and armed along the centre with a line of solitary robust claws, the margins obtuse, very powerfully armed near the base with long (3–4 cm.) and robust, straight, horizontal spines; on the intermediate portion the spines are shorter, thicker, and slightly deflexed and on the upper part are gradually transformed into robust claws; the rachis on its upper surface has a smooth salient angle and more or less concave side-faces; on the lower surface it is armed on each side and along the centre with solitary robust claws, which occasionally become more or less confluent upwards; the rachis and petioles are sprinkled with small appressed rusty scales; leaflets not numerous (18 in all in one leaf), very inequidistant and considerably spaced, rigid papyraceous, broadly lanceolate or lanceolate-elliptical or at times slightly broader above the middle, somewhat concave-convex and plicate, 7–9-costulate, tapering lower down to a rather acute base, the apex acute, bristly; all nerves and the margins quite smooth; transverse veinlets very approximate and fine; the intermediate leaflets are the largest, 35 cm. long, 7 cm. broad: the upper gradually smaller: the two of the apex the smallest, free at the base, 20 cm. long, 3 cm. broad: the lowest 25–30 cm. long, 3–4 cm. broad. *Male spadix* partially twice branched, elongate (1·3 m. long in one specimen), slender, unarmed or with a few rudimentary spines on

the lower elongate axial parts, rigid and erect in its lowest portion, nodding in the upper, with 4–5 much spaced, gradually diminishing primary or compound partial inflorescences and with a very slender, almost capillary, unarmed appendage; at its upper end the lowest compound partial inflorescence is about 50 cm. long and bears about 10—12 gradually diminishing spreading secondary or spikelet bearing branchlets on each side; the upper secondary branches are gradually shorter and with fewer spikelets, and those towards the end are reduced to simple spikelets, but more elongate than usual; primary spathes strongly flattened, very narrow, subcoriaceous, rigid, split and open on one side almost to the base, dotted with small rusty scales; secondary spathes narrowly tubular infundibuliform, truncate and deciduously ciliolate-paleaceous at the mouth, produced at one side into a short triangular acute point; the spikelet-bearing branchlets are inserted just at the mouth of their respective spathes, and have a distinct axillary callus with transverse rima: the lowest is 10–15 cm. long and bears on each side 12–18 spreading, gradually diminishing spikelets and is tail-like with simply bifarious flowers at its end; tertiary spathes short and loosely infundibuliform; the spikelets of the lower part of the branchlets of the lower partial inflorescences are 12–15 mm. long and have 8–10 flowers on each side; those of the upper part of the largest inflorescences and those of the inflorescences towards the end of the spadix are 2–3 times as long and proportionally with more flowers; spathels very closely packed, bracteiform, concave, horizontal or slightly deflexed, strongly striately veined, ciliolate, their points acute and longer than their respective involucre which is dimidiately cupular, bidentate on the side next to the axis and striately veined. ***Male flowers*** horizontal and in contact with one another causing the spikelets to assume a pectinate appearance, very narrow, terete acute, 5–5·5 mm. long, 1–5 mm. thick; the calyx tubular, briefly 3-toothed, striately veined; the corolla polished, twice as long as the calyx. *Female spadix*...............

HABITAT.—N. W. Borneo in Sarawak on Mount Mattang near Kuching (*J. Hewitt*, Febr. 1908 in Kew Herbarium).

OBSERVATIONS.—Closely related to *C. bacularis* but easily distinguishable by its large leaves with few, broadly lanceolate, pluricostulate, inequidistant leaflets, quite smooth on the margins and on the nerves on both surfaces.

SUPPL. PLATE 24.—Calamus Hewittianus *Becc* Terminal part of a plant; intermediate portion of a leaf; an entire male spadix. Hewitt's specimen in the Herbarium at Kew.

89*b*. CALAMUS JAHERIANUS Becc. n. sp.

DESCRIPTION.—Apparently non-scandent. ***Stem*** .... ***Leaves*** .... ***Male spadix*** erect, non-flagelliferous, quite unarmed in every part, forming an elongate-cupressiform, loose, ultradecompound panicle, more than a metre in length, composed of about 6 gradually diminishing partial inflorescences; primary spathes rigid-papyraceous, elongate, split longitudinally from the middle upwards and expanding thence into an auriculiform, lanceolate, acuminate, entire limb; they are tubular in their lower part, which gradually narrows and pass into the slender but rigid, strongly

flattened, two-edged main axis; are of a cinnamon-brown colour, closely sprinkled with small rusty scales, and conspicuously, though finely, striate longitudinally; the lowest primary spathe is larger than the others, has a limb about 18 cm. long, but in other respects is similar to the others; the partial inflorescences are elongate: the lowest and largest is 30 cm. long and bears distichally 17 branchlets or compound spikelets (in one specimen); the other partial inflorescences are gradually shorter and have fewer branchlets, but all, even the uppermost, bear secondary, although scantily flowered spikelets; secondary spathes elongate-infundibuliform, 10–20 mm. long, loosely sheathing in their upper part, puberulous and finely striately veined, truncate, entire and finely ciliate at the mouth, prolonged at one side into a triangular acuminate point; the lower (and largest) branchlets are 7–8 cm. long and carry distichally numerous (12—15), gradually diminishing secondary spikelets; the upper branchlets speedily decrease in length and number of spikelets; tertiary spathes (those of the compound spikelets) hairy-ramentaceous outside, membranous, shortly and broadly infundibuliform, entire, produced at one side into a spreading triangular acute point; spikelets very small, curved or subscorpioid: the largest, or those of the lower part of the branchlets, 5–6 mm. long, with 4–5 very approximate flowers, at most; the uppermost spikelets with 3–4 flowers only in all; spathels closely packed, membranous, bracteiform, deflexed, concave, broadly ovate, acute, strongly striately veined; involucre calyculiform and apparently formed by two broadly ovate acute, strongly striately veined bracts, which are connate by their bases and adnate laterally to the axis of the spikelet. *Male flowers* seen only in the very young state; the calyx strongly striately-veined. Other parts unknown.

HABITAT.—Dutch W. Borneo; the precise locality not stated. Collected by *Jaher* (Buitenzorg Herbarium).

OBSERVATIONS.—Known only from the male spadix, but it is obviously a near ally of *C. bacularis*, distinguishable from that by the more rigid and more regularly and densely paniculate spadix; by the primary spathes having a rigid, erect, entire, elongate ear-like limb; and by the male flowers having a strongly striately veined calyx.

SUPPL. PLATE 25.—Calamus Jaherianus *Becc.* Two male spadices; the one on the left side of the plate almost entire. From Jaheri's specimen in the Buitenzorg Herbarium.

90. CALAMUS PERAKENSIS Becc. Add:—Ridley Mat. Fl. Mal. Penins. ii, 202.
C. lanatus Ridley (printed *lanata*) excl. description of fruit.

Add to localities according to Ridley:—Bukit Kapayung in Perak.

Ridley's number for the Selangor specimens is 7879, not 3839 as printed on p. 292 of this volume.

OBSERVATIONS.—I have reduced *C. lanatus* Ridley to *C. perakensis* after examination of the type specimens of the first (No. 12116 from Semangko Pass) kindly forwarded to me by the author himself, and consisting of male spadices and portions of the leaves; the petiole is armed with short spines, covered at the points and edges with

an easily deciduous, woolly down. These parts undoubtedly belong to *C. perakensis*, but with them is glued a spadix with young fruits, which most certainly belongs to *C. Guruba*.

In conclusion *C. lanatus* was founded on the leaves and male spadices of *C. perakensis* and the fruits of *C. Guruba*.

91. CALAMUS RAMOSISSIMUS Becc. Add:—Ridley Mat. Fl. Mal. Penins. ii, 201.

For this plant Ridley adds the following localities, besides those mentioned by me:—Pahang: Pahang River at Kwala Tenok (*Ridley*). Perak: Gunong Keledang: Bujong Malacca (*Ridley* No. 9809); Gopin (*King's Coll.* 545). Negri Sembilan; Gunong Angsi (*Ridley*); Kedah, Gunong Terai (*Ridley*).

92. CALAMUS PASPALANTHUS Becc.

OBSERVATIONS.—Specimens with male and female spadices have been collected again by *Ridley* in Sarawak at Tambusan (No. 12403). They correspond exactly to those already described by me, and have the spathels and the involucre of the male spikelets strongly striately veined, and the spathels aculeolate in the female spadix. Another specimen collected also in Sarawak at Quop by *Hewitt* (Herb. Kew.) has a male spadix indistinguishable from that figured in plate 111, but the spathels and the involucre are not so strongly striately veined as in the preceding.

CALAMUS PASPALANTHUS var. PENINSULARIS Becc. Add:—*C. paspalanthus* Ridley, Mat. Fl. Mal. Pen. ii, 200; and (perhaps) *C. intumescens* (Becc.) Ridley, l. c. (printed *intunescens*).

OBSERVATIONS.—Ridley considers *C. intumescens* as a distinct species from *C. paspalanthus.* But the typical *C. paspalanthus* is a Bornean plant, and the Malayan specimens referred by Ridley to it are the same upon which I have based the var. *peninsularis.* The original *Calamus* (*Daemonorops?* Becc.) *intumescens* was founded on some sterile specimens collected by Scortechini in the State of Perak, of which one is reproduced in plate 113 (vol. XI), and which I have supposed to represent a young state of *C. paspalanthus* var. *peninsularis*. In any case the differences between the two species (*paspalanthus* and *intumescens*) as understood by Ridley, must be very trifling, as he quotes for both the same number 11209 from Batu Pahat.

CALAMUS PASPALANTHUS var. PTEROSPERMUS Becc. in Bot. Zahrb. xlviii (1912) 91.

DESCRIPTION.—The vegetative organs differ very slightly from those of the "forma typica." The sheathed stem is 20–22 mm. in diameter; the leaf sheaths are armed with more numerous and more slender spines than in the type, but as in it have the peculiar swelling at the base of the petiole; the leaf-sheath flagella are extraordinarily long and slender; the leaves are 1·4 m. long in the pinniferous part; the petiole is 30–35 cm. long; the rachis is covered with the brown-purplish hairiness peculiar to the type; the leaflets are also as in the type but slightly broader (10–12 mm. broad, 25–28 cm. long) *Male spadix*, ... *Female spadix* exactly as in the typical plant of *C. paspalanthus* from Sarawak, only the spikelets are slightly more slender and the secondary spathes are more conspicuously covered with small prickles; the spathels are unarmed. *Female flowers* small, ovoid,

bluntish. *Neuter flowers* very similar to the male ones. *Fruiting perianth* quite explanate. *Fruit* ovoid elliptical, almost equally tapering towards both ends, shortly conically beaked and acute, 16–17 mm. long, 12 mm. broad; scales arranged in 15 longitudinal series, almost glossy, convex, not or very obsoletely grooved along the centre, of a bright reddish-brown colour, with blackish margins; the apex obtuse. *Seed* enveloped by a fleshy acidulous integument and of a very irregular and peculiar shape; it has a flattish and suborbicular surface on the raphal side with very acute and almost winged edges, and on the other side it has an elevated concave surface, also sharply edged but smaller than the raphal; the base is emarginate. *Albumen* equable. *Embryo* basal.

HABITAT.—S. W. Borneo, *H. Winkler* (1908) No. 2882 in the Breslau Botanic Garden Herbarium and in the Herbarium Beccari.

OBSERVATIONS.—This *Calamus* offers a very curious case of variability in a species, for in the vegetative organs it is almost identical in every detail with the "forma typica" of *C. paspalanthus* from Sarawak, while it differs considerably from the type in the very peculiar shape of the seed.

SUPPL. PLATE 26.—Calamus paspalanthus VAR. pterospermus *Becc.*—The upper end of a plant, with an entire very young female spadix; the summit of a leaf; a partial inflorescence with mature fruits; detached seeds, one cut longitudinally through the embryo. The type specimen Winkler No. 2882.

93. CALAMUS GURUBA Ham. Add:—Becc. in Webbia di. U. Mart. iii, 243 and in Bull. Mus. Hist Nat. Paris 1911, 159.

C. multiramea Ridley, Mat. Fl. Mal. Penins. ii, 202 (excl. description of the fruit).

OBSERVATIONS.—Add to the localities:—Cochin China; Bassac at Ubon, Mekong) Expedition collected by Dr. Thorel (Herb. Paris). I have reduced *C. multiramea (sic.)* Ridley to *C. Guruba* after inspection of the type specimens (No. 8405, from Dinding in Perak) kindly forwarded to me by Mr. Ridley himself; they consist of a portion of the sheathed stem, an entire leaf, and spadices with male flowers; all these parts agree exactly with the corresponding ones of *C. Guruba* from Assam; but with these is mixed a portion of a spadix with fruits nearly ripe, which most certainly is referable to *C. concinnus* Mart., a species first discovered by Helfer in the Mergui Archipelago, and not found again until now by modern collectors. It is this fruiting spadix which Ridley describes as that of *C. multiramea.*

100. CALAMUS RHEEDEI Griff.

DESCRIPTION.—I can now complete the description of this species, which wa known only through a few detached fruits, having been able to study a specimen, lent to me by Mr. Burkill and consisting of a portion of a leaf and of an entire partial inflorescence in fruit; this specimen was collected in S. Coimbatore, Madras (Herb. Rep. on Economic Products to the Government of India No. 23503).

The portion of the leaf is from the central part; the rachis underneath is convex, and armed with numerous, unequal, solitary, scattered, rather strong black claws; leaflets not many, inequidistant, remote (15–18 cm. apart on each side), in the portion seen by me not fascicled, rather large, about 40 cm. long, 6 cm. broad, elongate-lanceolate, green on both surfaces, with 5 slender non spinulose costae and a few secondary nerves; the mid-costa slightly stronger than the side ones; transverse veinlets rather distinct, sinuous. *Female spadix* apparently large, one partial inflorescence is 30 cm. long, pyramidate in outline with gradually shorter spikelets on each side; secondary spathes elongate-infundibuliform, flat in their lower part on the axial side, 15–20 mm. long, truncate at the mouth and prolonged at one side into a triangular acuminate point, armed all round below the mouth with some relatively strong claws; spikelets arched, spreading or recurved, inserted just at the mouth of their respective spathes with a not very distinct axillary callus; the lowest and largest spikelet is 7 cm. long, and has 9–10 bifarious flowers on each side; the following are gradually shorter and those of the summit have 3-4 flowers only; the axis of the spikelets is strongly zig-zag sinuous; spathels asymmetrically infundibuliform, a good deal narrowing towards the base, where flat on the axial side, entire and truncate at the mouth, prolonged at one side into a triangular acute point, glabrescent or slightly furfuraceous, usually furnished below their point with a rather robust, black-tipped spine; involucrophorum attached outside the mouth of its own spathel at the base of the one above, distinctly callous at its axillar cupular, truncate, two-keeled, lunately emarginate and 2-toothed on the side next to the axis; involucre slightly raised above the involucrophorum, cupular, truncate, 2-toothed and slightly lunately excavate on the margin on the side of the neuter flower, of which the areola is lunate and sharply defined by a raised acute margin.

101. CALAMUS HUEGELIANUS Mart.

DESCRIPTION.—I have seen in the Herbarium at Berlin a male spadix of this species in flower without precise locality collected by *Metz* certainly in Southern India. The *male spadix* is elongate, ultradecompound, with several scorpioid partial inflorescences and flagelliferous at its upper end; the partial inflorescences are 25–40 cm. long, have several also arched scorpioid secondary or spikelet-bearing branchlets each of which bears few gradually diminishing spikelets very reduced in length and number of flowers towards the end. The spikelets are inserted outside the mouth of their respective spathes with a very distinct axillary callus: are spreading arched or recurved: the lowest are at times branched again: the intermediate are 19–20 mm. long and bear few flowers in two collateral assurgent series (4–5 flowers in each series); the upper spikelets gradually shorter and with fewer flowers; spathels short, suddenly expanded into a subinfundibular-bracteiform bluntish limb; involucre conspicuous, orbicular, flat. *Male flowers* relatively large, 7 mm. long, narrowly ovoid, very obsoletely trigonous, 3 mm. broad at the base, narrowing towards the apex; the calyx tubular, coriaceous, not deeply 3-toothed, striately veined; the corolla also coriaceous, twice as long as the calyx. The uppermost flower in every spikelet is borne upon a slender very distinct pedicel.

102. CALAMUS GAMBLEI Becc.

Add to the localities:—S. Coimbatore (Herb. Rep. Econ. Prod. of India No. 25862). Specimen forwarded to me by *Mr. Burkill.*

104. CALAMUS MELANACANTHUS Mart.

I have received from *Mr. Burkill* a specimen of this *Calamus*, which was known only from Wallich's No. 8606 B. Burkill's specimen bears portions of a fruiting spadix corresponding exactly to the type of Wallich; it bears the label:—"Thaungyan, Tenasserim, Burma. Vern. name "Medan" (Herb. Rep. Econ. Prod. of India, No. 21002 (*a*)."

105. CALAMUS DIEPENHORSTII Miq. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 199.

105. CALAMUS DIEPENHORSTII var. SINGAPORENSIS Becc. Add:—*C. singaporensis* Becc., Ridley, Mat. Fl. Mal. Penins., ii, 199. Ridley considers this specifically distinct from the typical *C. Diepenhorstii.*

105. CALAMUS DIEPENHORSTII Miq. var. EXULANS Becc. in Philip. Journ. Sc. Botany, v, (1909) 627, and vi, (1911), 230.

DESCRIPTION.—This possesses a great likeness to some Malayan forms in the spinescence of the leaf sheaths, in the extraordinary length of the spadices and in all its principal characteristics; it differs only in the leaflets, which are without bristles on the mid-costa above, but beneath have the mid-costa closely bristly and the side nerves smooth. In the Malayan forms the leaflets have long bristles on three nerves beneath, the mid-costa being smooth, while the mid-costa above is bristly. The female spikelets of this variety are also less distinctly zig-zag sinuous, the involucre of the flower does not form so regular and deep a cup as in the type, and the areola of the neuter flower is crescent-shaped and not roundish. Otherwise the similarity of the Philippine variety to the Malayan type is quite evident.

HABITAT.—Philippines. The male plant was collected by *F. W. Foxworthy* in March 1906 on Mount Victoria, in Palawan, (Herbarium Bureau of Science) Manila, No. 756; and the female by *Loher* in Luzon at Montalban, Province of Rizal, March 1906, (No. 7054 in Herb. Kew. Vernacular name "Palimanac)." and in the Island of Polillo on Mount Malulud by *Robinson* (Herb. Bur. Science Manila No. 9111.)

OBSERVATIONS.—The male specimen has a leaf 1·5 m. long; the leaflets are numerous, equidistant, subtricostulate; the mid-costa is rather prominent above, bristly spinulous near the apex, and the side costae have long bristles; underneath the mid-costa is furnished with bristles, and the side nerves are smooth. The male spadix is as usual extraordinarily long, and not essentially different from that of the Malayan type plant but the secondary and tertiary branches and the spikelets are inserted just at the mouth of their respective spathes which terminate in a broad, horizontal, or deflexed point; the male flowers also are slightly smaller, more approximate, inserted at a wider angle, and therefore have the spathels shorter and less distinctly infundibuliform.

In Loher's female specimen the sheathed stem is 3 cm. in diameter, the leaf-sheaths are strongly gibbous above and densely armed with horizontal rows of confluent, triangular, laminar, black spines, which have a lighter coloured, sharply defined base. An entire leaf has a petiolar part 15 cm. long, and on the whole is 1·10 m. in length; the petiole has prickly margins; the rachis is armed beneath with a line of single claws along the centre, and with a similar line on each side. The leaflets are numerous, equidistant, almost equally green on both surfaces; the mesials 30–35 cm. long, 16–18 mm. broad, rather distinctly 3-costulate, above the midcosta is smooth or has a few small spinules near the apex, the side costulae are slender, and also with a few straggling spinules underneath; the mid-costa is rather closely bristled, and the side-nerves are usually smooth, but on these also a few setiform spinules may sometimes be seen. The *spadix* is six (!) metres long (in one specimen) inclusive of a slender, terminal, very minutely and closely clawed cirrus, simply decompound, with a few, very distant, partial inflorescences, exactly as in the type, but the spathes are more thickly beset with prickles; the secondary and tertiary spathes are also set with minute prickles in their upper part; the spikelets are 15–18 cm. long, very slightly zig-zag sinuous, with as many as 15–16 flowers on each side; the involucre is shallowly cupular, and the areola of the neuter flower is crescent-shaped with sharp margins. The *fruit* (in the specimen from Polillo) agrees quite well with that of the plant from the Malayan Peninsula; it is globular, 15–16 mm. in diameter, obtusely beaked, with straw-coloured scales; the seed is globular, 10 mm. in diameter, pitted on the surface and with deeply ruminate albumen, exactly as in the type.

106. Calamus marginatus Mart. Add:—Becc. in Bot. Zahrb. xlviii, (1912) 91.

Description.—Not very high scandent (3 m. high—Winkler). *Sheathed stem* 20–25 cm. in diameter. *Leaf-sheaths* flagelliferous, very short, very obliquely truncate at the mouth, conspicuously gibbous or with a roundish swelling at the base of the petiole, powerfully armed with approximate, large, laminar, elastic, brown, horizontal spines, usually 15–25 mm. long, and 4–6 mm. broad at the base, or at times considerably smaller. *Ocrea* liguliform and produced beyond the rim of the mouth of the leaf-sheaths, dry, glabrous, deciduous. *Leaf-sheath* flagella very long and slender (nearly 3 m. long), armed on the sheathing parts with very small scattered prickles and on the axial prolongations at regular intervals, with half-whorls of small, very sharp claws. *Leaves* non-cirriferous, 1·1 m. long in the pinniferous part; the petiole 12–15 cm. long, 10 mm. broad, concave or broadly channelled on the upper surface, where armed, especially near the edges, with blackish, ascendent spines: the lower surface is convex and armed along the centre with a line of spines, and still more powerfully near and on the acute edges, where the spines are in 2–3 lines, laminar, rigid, approximate, divergent and horizontal, the lowest being 15–20 mm. long and the upper shorter; rachis polished, armed on the lower surface throughout along the centre with a line of solitary claws and in its lower portion with another line on each side of short straight horizontal spines; on the upper surface, the rachis in its lower portion is channelled along the centre and has a deep furrow on each side, where the leaflets are inserted; higher up it has a very sharp smooth salient angle and slightly concave

side faces: leaflets numerous, equidistant, 17–20 mm. apart on each side of the rachis, very regularly inserted at an angle of 45°, almost glossy on the upper surface, paler and dull on the lower, thinly papyraceous, rigidulous, linear-lanceolate or linear-ensiform, very acuminate to a slightly bristly tip, furnished on the upper surface with 3 sharp prominent smooth costae; on the lower surface the costae are not prominent and are covered throughout with very approximate small spinules; transverse veinlets very fine and very approximate; margins quite devoid of bristles or spinules, more or less distinctly thickened, especially the upper, and with the marginal nerve very minutely shagreened on the lower surface, when seen under a good lens; the intermediate leaflets 25–30 cm. long, 14–16 mm. broad, the upper gradually smaller, the two of the terminal pair free at the base. *Male spadix* . . . *Female spadix* simple-decompound, flagelliform, about as long as the leaf-sheath flagella, and like these equally slender and differing only in being furnished with very few (3 in one specimen), very distant, partial inflorescences; the primary spathes tubular, very strictly sheathing, thinly coriaceous, the lowest 40 cm. long, 8–10 mm. broad, flattened, acutely two-edged, obliquely truncate at the mouth and with glabrous entire rim, produced at one side into a triangular dorsally keeled point; the edges spinulous in the lower part, smooth above; the external surface is smooth and polished lower down and sprinkled with very small tuberculiform spinules from the middle upwards; the inner or axial surface is quite smooth; the following spathes are less flattened and have blunt edges, and the upper are almost cylindrical and minutely prickly in their upper part; all are entire, obliquely truncate, glabrous and smooth at the mouth; the elongate axial parts between two partial inflorescences are armed at almost regularly intervals with 3-nate claws; the terminal clawed flagellum is very slender. Partial inflorescences spring erect from inside but very near the mouth of their respective spathes, slender, elongate; the lowest the largest, 30–40 cm. long, terminates in a slender tail-like appendage and bears only 4–5 spikelets on each side; the upper partial inflorescences are shorter, and have 6–7 spikelets in all; scondary spathes about 3 cm. long, very narrowly tubular, slightly enlarged above or subclavate, very strictly sheathing, obliquely truncate and glabrous at the mouth, sprinkled with very minute tuberculiform spinules. Spikelets attached just above the mouth of their respective spathes, slightly arched, spreading or recurved, all almost of one size, about 2·5–3 cm. long, with 5–6 flowers on each side; spathels infundibuliform, tapering to a narrow base, truncate at the mouth, produced at one side into a triangular, subulate, spreading point; involucrophorum irregularly cupular; involucre also irregularly cupular, immersed within and at the same level with the involucrophorum; areola of the neuter flower depressedly lunate, sharply edged. *Female flowers*, judging from the fruiting perianth, about 4 mm. long; the calyx and corolla apparently rusty furfuraceous. *Fruiting perianth* pedicelliform, subcampanulate; the calyx smooth and callous at the base, split down about to the middle into 3 semi-ovate, striately veined lobes; the segments of the corolla very slightly longer than the calyx. *Fruit* small, 12–13 mm. long, including the mucro and perianth, 7 mm. broad, obovoid, tapering considerably towards the base, and suddenly contracted above into a stout mucro, 2 mm. long which is crowned by the narrow-acuminate, circinate stigmas; scales arranged in 16–17 longitudinal series, yellowish brown, with relatively broad darker reddish edges,

glossy, convex, not or very obsoletely grooved along the centre, the margins scarious, very finely denticulate-fringed, the point rather acute. *Seed* ovoid, 6 mm. long, 5 mm. broad, rounded at both ends, deeply and coarsely pitted; albumen subruminate, embryo basal.

HABITAT.—S. W. Borneo near Djihi, *H. Winkler*. No. 3324 in the Breslau Botanic Garden and Beccari Herbaria.

OBSERVATIONS.—The peculiar hairiness of the lower surface of the leaflets has enabled me to recognize at once in Winkler's specimens from East Borneo, the *Calamus* which I had collected in Sarawak and identified with *C. marginatus* This *Calamus* was till now known from sterile specimens only and from the general appearance of the vegetative organs I had approximated it to *C. Diepenhorstii*. Now, that the fruit is known, I think that its affinities are more with the species included in group V and especially with *C. tenuis* than with those of group X, as the albumen of the seed cannot be properly termed ruminate; in fact the integument of the seed of *C. marginatus* does not really interpenetrate the mass of the albumen as in *C. Diepenhorstii*, but is easily removable from the pits, however deep, of the surface of the seed.

C. marginatus growing in S. E. Borneo differs from that of Sarawak in that its leaf-sheaths are shorter, and densely armed with spines; also the petiole is more spinous and the leaflets smaller.

The specimens of *C. marginatus* from South Borneo really ought to be considered as the type plant, but of the latter only one leaf is known, so that a rigorous comparison with either the plant of N. W. or with that of S. E. Borneo is impossible.

In my description of the type *C. marginatus* (p. 326) I described the petiole as being narrowly channelled on the upper surface, as it appeared so in my specimens, but it is actually concave on the upper and convex on the lower surface. My specimen had shrivelled in drying.

SUPPL. PLATE 27.—Calamus marginatus *Mart.* Upper end of a plant with the bases of some leaves; a flagellum and the lower part of a spadix; the female spadix in flower; partial inflorescence loaded with fruits. From Winkler's No. 3324.

I consider as belonging to *C. marginatus*, a specimen received from Kew, which was collected by *Hewitt* on the River Barram in N. W. Borneo in September 1907. This specimen consists of a portion of a leaf which agrees in the minutest details of the leaflets with that collected by me, and is moreover accompanied by a male spadix, which being hitherto unknown I shall now describe.

The *male spadix* is apparently ultra-decompound; the partial inflorescence seen by me is 70 cm. long and carries 6–7 gradually decreasing compound spikelets on

each side, and ends in a slender tail like unarmed appendage. Secondary spathes ubular, closely sheathing, slightly enlarged above where more or less minutely tubercled-aculeolate. The compound spikelets are spreading and inserted at the mouths of their respective spathes, the lower ones, largest, are 10–11 cm. long and carry 9–10 simple spikelets on each side; the upper compound spikelets are shorter and have fewer simple spikelets. Tertiary spathes infundibuliform, smooth and glabrous at the mouth and produced at one side into a short triangular point. The spikelets spring erect from the mouths of their respective spathes, are short (10–12 mm. long), flattened, and have 8–10 very approximate flowers on each side; spathels concave, bracteiform, strongly striately veined and with a short triangular point which subtends its respective flower. Involucre shallowly cupular, lunately excavate on the axial side. *Male flowers* ovoid when very young; the calyx strongly striately veined.

107. CALAMUS CILIARIS Bl. *Rotang ciliaris* Baill. Hist. des Plant. xiii. Add:—259, fig. 205—208.

OBSERVATIONS.—In the Herbarium at Buitenzorg are preserved some sterile specimens of a *Calamus*, collected by Korthals in Sumatra and labelled by Blume himself *C. ciliaris*, which may be considered as really belonging to this species, whereas others, also from Sumatra, (but the precise locality not given,) apparently belong to a variety of it, or to a very nearly allied species.

108. CALAMUS EXILIS Griff. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 204.
C. ciliaris (non Bl.) Ridley, l. c. 203.
C. Curtisii Ridley, l. c. 204.

OBSERVATIONS.—Ridley acknowledges in the Malayan Peninsula a *C. ciliaris* Bl. as different from *C. exilis* Griff., this last he says growing only on Mount Ophir. He holds that the specimens from Perak collected by Scortechini and King's collector, which were referred to *C. exilis* Griff. by Sir J. Hooker and myself in the "Flora Indica" belong to *C. ciliaris* Bl. I have however carefully examined Griffith's type specimens of *C. exilis*, and have been unable to discover any appreciable specific differences between them and the other specimens collected subsequently by different collectors in Perak and Johore. In any case if it were proved that the plant from Mount Ophir is specifically distinct from that of the other mentioned localities (a thing which I believe hardly possible) in no way could the latter be referred to *C. ciliaris* Bl., as is evident on comparing my plate 129 of *C. ciliaris* from Java with plate 130 of *C. exilis* from Perak.

I have seen the type specimens of *C. Curtisii* from Kwala Lumpur No. 2392 with male flowers, and one from Semangko and from Bukit Kutu No. 7883, kindly forwarded to me by Ridley himself, and after a very careful examination I have been unable to discover any specific character by which *C. Curtisii* could be maintained as distinct from the typical *C. exilis*.

110. CALAMUS PILOSELLUS Becc.

OBSERVATIONS.—I have seen of this species the upper part of the stem with an entire leaf, preserved in the Herbarium at Buitenzorg (No. 16718) collected in Borneo, almost certainly by Teijsmann, in the Residency of Sambas or of Pontianak. Malayan name "Rotan Boloh." The leaf-sheath is smooth, minutely punctulate when seen under the lens; the leaf is 65 cm. long; the leaflets are more numerous (about 45 pairs) and slightly smaller than in the type specimen, 8–10 mm. apart on each side, 8–10 cm. long, 8 mm. broad, otherwise the leaves with the petiole and rachis are exactly as already described.

110*a*. CALAMUS SCABRIFOLIUS Becc. n. sp.

DESCRIPTION.—Scandent, slender. *Sheathed stem* about as thick as a man's little finger *Leaf-sheaths* strongly gibbous above, in the small portions seen by me unarmed, dull, not scabrid to the touch. *Ocrea* very short, obliquely truncate, glabrous. *Leaves* non-cirriferous, 6–90 cm. long including the petiole; the latter 14–15 cm. long, glabrous and almost polished, rounded and smooth underneath, deeply and broadly channelled on the upper surface, the edges acute, armed with a few small claws; rachis armed underneath along the centre with a line of solitary, very sharp claws, which become closer and smaller towards the summit; on the upper surface it is bifaced and has the salient angle covered with soft rusty hairs. *Leaflets* numerous, equidistant, about 15 mm. apart, very regularly inserted at an angle of about 45°, alternate or almost opposite, elongate, very narrow, almost equally tapering towards both ends, very finely acuminate at the apex, thinly papyraceous, rather firm, green and subconcolorous on both surfaces; the upper surface has 3, and often 5 sharp costae and several unequal secondary slender nerves; the costae are ciliate and the secondary nerves are very closely covered with innumerable short bulbous hairs (visible to the naked eye) which render that surface very scabrid; the under surface has the nerves more slender and less prominent than the upper, but it is also very closely covered with bulbous hairs, a little finer however than those of the other surface; the margins are inconspicuously and shortly ciliate; transverse veinlets indistinct; the mesial leaflets are 20–26 cm. long and 12–14 mm. broad at their middle; the lowest are somewhat shorter and narrower; those near the summit suddenly smaller; the two of the terminal pair are the smallest, free at their base. *Male spadix* more than a metre in length, terminating in a slender aculeolate flagellum; it has 2–3 partial inflorescences, twice branched in their lower part; the spathes are glabrous and not in the least degree scabrid and are exactly like those of the female spadix; spikelets arched, slender, the largest about 3 cm. long, with 2 series of 6–7 flowers each; spathels infundibuliform, loosely sheathing; involucre shallowly cupular, inserted outside its own spathel, also shallowly cupular, slightly apiculate at one side and frequently shortly auriculiform. *Male flowers* slender, subtrigonous, 4-5 mm. long, 1 mm. in diameter, subacute; the calyx campanulate, broadly 3-toothed; the corolla two and a half times as long as the calyx. *Female spadix* simply decompound, 1–1·2 m. long, inclusive of the terminal, 50 cm. long, filiform flagellum, rigid and erect in its lowest part, glabrous and not scabrid, and with only 3-4 partial, strongly scorpioid inflorescences; primary spathes elongate, tubular, closely sheathing, produced at the summit into a

triangular, dorsally keeled, acuminate point, the margins of the mouth entire, glabrous; the lowermost spathe is unarmed, flat on the axial side, convex on the back and with very sharp margins; the upper spathes are slightly flattened, keeled and more or less armed, especially on the suddenly attenuated slender base, with scattered very sharp claws or quite smooth; partial inflorescences arising erect from inside the mouth of their respective spathes, then strongly arched-scorpioid; the largest, lowest, is about 20 cm. long and has several alternate, unilateral, gradually decreasing spikelets; upper partial inflorescences gradually smaller; secondary spathes glabrous, smooth, tubular-infundibuliform, truncate and entire at the mouth, acute at one side; spikelets attached at or slightly above the mouth of their own spathes with a distinct axillary callus, spreading, arched scorpioid; the lower and largest are 4–6 cm. long and have 2 series of rather distant assurgent flowers, each series being of 8–10 flowers; upper spikelets gradually shorter, the uppermost with 2–3 flowers only; spathels tubular-infundibuliform, truncate at the mouth with entire glabrous margin, acute or apiculate at one side; involucrophorum attached outside its own spathel at the base of the one above, calyculiform, subdiscoid, distinctly pedicellate; involucre shallowly cupular or pateriform, orbicular, entire; areola of the neuter flower obscurely lunate and with a conspicuous central tubercle, sometimes transformed into a short callous pedicel. *Female flowers* oblong or narrowly ovoid, 3–5 mm. long, slightly narrowed to the summit; the calyx glabrous, obsoletely striately veined, very shortly 3-toothed; the corolla as long as the calyx; the ovary is acute and protrudes beyond the perianth and is crowned by the narrow acute spreading stigmas. *Fruiting perianth* pedicelliform, the lobes of the calyx and the segments of the corolla almost erect. *Fruit* obovate, rounded above and very suddenly terminating in a distinct slender mucro, crowned by the very small stigmas: it tapers gradually to an acute base, is 16–17 mm. long (inclusive of the perianth and the mucro); the scales are squarrose or rather loosely imbricate, arranged in 12 longitudinal series, have a triangular obtuse point, are flattish, very faintly grooved along the centre, dull, pale yellowish, with narrow, almost entire, black margin. *Seed* not seen when quite mature.

HABITAT.—Borneo; at Puak in Sarawak, collected by *Ridley* in September 1905. (No. 12406 in Herb. Kew.); also at Kuching (*Hewitt* in the Kew and Manila Herbaria).

OBSERVATIONS.—It is a near ally of *C. hispidulus*, *C. pilosellus*, and *C. sarawakensis;* from the last it is at once distinguishable by its leaves with their numerous equidistant leaflets; from *C. hispidulus* it differs in the smooth leaf-sheaths, and in the shape of the fruit, which in *C. scabrifolius* tapers to a very acute base, besides other characters in the leaflets. It most resembles *C. pilosellus*, differing however from that species also in the smooth and not scabridulous leaf-rachis. The chief difference lies in the leaflets which are larger, less numerous and are rendered scabrid on both surfaces by innumerable hairs resting on tuberculiform bases which although very small are visible to the naked eye.

SUPPL. PLATE 28.—Calamus scabrifolius *Becc.* An entire leaf in two parts; female spadix in flower; detached fruits. From Ridley's specimen No. 12406 in the Kew Herbarium.

110*b*. CALAMUS GIBBSIANUS Becc. sp. n.

DESCRIPTION.—Scandent, slender. *Sheathed stem* about as thick as a finger. *Leaf-sheaths* rather densely armed with unequal, scattered, or more or less confluent, horizontal, light-coloured, rather rigid spines, of which several are very small, and others have a rather swollen base and are 10—15 mm. long; the surface between the spines is scurfy and sprinkled with small spinuliform hairs. *Ocrea* short, slightly hairy. *Leaves* about 70 cm. long including the petiole; the latter 15 cm. long (in one specimen), strongly depressed, flat on the upper surface, convex underneath, strongly armed on the edges with unequal, rather robust spines, of which only a few near the base are straight and all the others hooked; rachis with a very acute salient angle and flat side-faces above, armed underneath with a line of rather robust single claws; leaflets not very numerous, 11–12 on each side, subequidistant, 3—sub-5-costulate, narrowly lanceolate, broadest about their middle and thence almost equally tapering towards both ends, acuminate above to a subulate bristly ciliate apex, the base rather acute: they are rather firmly papyraceous, green on both surfaces, very slightly paler underneath, where sprinkled with very minute, hair-like, whitish scales visible only under the lens; on the lower surface the mid-costa is closely covered with very minute hairs, the other nerves being smooth; on the upper surfaces the costae are sparingly spinulous only towards the apex; margins quite smooth; transverse veinlets conspicuous translucent, much interrupted, very sharp especially on the upper surface; the intermediate leaflets are 20–25 cm. long, 2·5–3 cm. broad; the upper gradually shorter but not narrower; the lowest somewhat shorter and narrower; the petiole, the rachis and especially the base of the leaflets on the under surface are covered with a soft rusty wool which is fugacious on the rachis and petiole but very abundant and apparently permanent at the base of the leaflets. *Male spadix* . . . *Female spadix* simply decompound; in one specimen it has only 3 partial inflorescences and is 1·7 m. long inclusive of the terminal, slender, clawed, 1 m. long flagellum; it is rigid and erect in its lowest part, not scabrid, but covered with very minute whitish hair like almost punctiform scales, visible only under a lens; primary spathes elongate, tubular, closely sheathing, produced at the summit into a triangular, dorsally keeled, acuminate point, glabrous at the mouth; the lowest spathe, flat on the axial side, convex and smooth or slightly prickly in its basal part on the back: the margins sharp and acutely serrate, or armed with short horizontal rather closely set prickles; upper partial spathes smooth or nearly so; partial inflorescences arising erect at or a little above the mouth of their respective spathes, then more or less arched; the largest, lowest, is 10–12 cm. long and has several unilateral speedily decreasing spikelets; upper partial inflorescences considerably smaller. All parts of the partial inflorescences are at first scurfy and later glabrous; their main axis is angular; the secondary spathes broaden in their upper part and are produced at one side into a triangular, membranous, acute point; spikelets attached at the mouth of their own spathes with a very distinct axillary callus, spreading, strongly arched: the lower and largest 4–6 cm. long, with two series of rather distant, assurgent flowers, each series consisting of 5–7 flowers; upper spikelets gradually shorter, the uppermost with 2–3 flowers only; spathels tubular-infundibuliform, truncate, entire and glabrous at the mouth, acute or apiculate at one side,

involucrophorum attached outside its own spathel at the base of the one above, with a distinct axillary callus, distinctly pedicellate in the lower part of the spikelets, expanded at its summit into a very shallowly cupular limb; involucre orbicular, pateriform, discoid; areola of the neuter flower obscurely lunate and with a conspicuous central tubercle usually transformed in a short thick pedicel. *Female flowers* 3 mm. long; the calyx glabrous, obsoletely striately veined, 3-toothed; the corolla as long as the calyx. *Fruiting perianth* pedicelliform. *Fruit* narrowly obovate or obovate-subclavate (not quite mature), suddenly acutely beaked, 16 mm. long, 6 mm. broad (probably somewhat larger when full grown); scales subsquarrose, arranged in 15 longitudinal series, with a triangular rather obtuse point, very slightly convex, not or very faintly grooved along the centre, dullish, straw-coloured, edged with a narrow red-brown line, the margin finely erose-ciliate. *Seed* elongate.

HABITAT.—British North Borneo on Mount Kinabalu, between 8–9,000 feet; collected by Miss *L. S. Gibbs*, Febr. 1910, No. 4848.

OBSERVATIONS.—Quite distinct in the group of *C. ciliaris* by its leaf-sheaths densely set with prickles; by the narrowly lanceolate subequidistant leaflets not hairy nor scabrid, and covered only with inconspicuous subpunctiform hair-like scales on their lower surfaces. In general aspect, in the spadices and in the shape of its fruits, it much resembles *C. hispidulus* and *C. scabrifolius*.

SUPPL. PLATE 29.—Calamus Gibbsianus *Becc.* The entire Gibbs' specimen No. 4348.

110*c*. CALAMUS BENKULENSIS Becc. n. sp.

DESCRIPTION.—Scandent and slender. *Sheathed stem* 10—12 mm. in diameter. *Leaf-sheaths* elongate, cylindrical, transversely plicate or slightly gibbous above, very obliquely truncate, and with a thin smooth margin at the mouth, and armed with a few scattered, relatively large, triangular, rigid spines, which point slightly upwards, have the base broad, swollen above, and concave underneath: otherwise the entire surface of the leaf-sheaths is rendered very scabrid by innumerable small prickles pointing upwards, similar to the larger spines but of a diminutive size. *Ocrea* liguliform, bearded. *Leaves* short, with very few leaflets and no petiole, and apparently ending in a slender clawed cirrus, at least there is a portion of something that seems such in the only leaf seen by me; the rachis is glabrous, about 45 cm. long in the pinniferous part: on its upper surface it is flat near the base and has a salient obtuse smooth angle in the remainder: underneath it is scabrid but only in its lowest part, and is armed throughout with rather distant, solitary or geminate or ternate claws. *Leaflets* very few, alternate, nine in all (in one specimen), rather firmly papyraceous, green, smooth and glabrous on both surfaces, slightly paler on the lower, 5-costulate, the middle costa slightly stronger than the side ones, which are slender and hardly distinguishable from a few secondary nerves which are also present; usually the leaflets have on the upper surface a conspicuous glossy band along the lower margins; similar bands occur occasionally along some of the longitudinal nerves, otherwise the upper surface is dull; transverse veinlets very fine, numerous and continuous; margins almost smooth or with an inconspicuous

distant appressed spinule here and there. The intermediate leaflets are the largest, elongate-spathulate, 36—38 cm. long and 45—52 mm. wide in their broadest part somewhat above the middle, and narrowing considerably from above the middle to an acute base, while above they contract rather suddenly into a short, subulate and at the sides slightly spinulous tip; the lowest leaflets are smaller, oblanceolate: the mesials narrower and more gradually acuminate: the uppermost narrowing almost equally towards both ends, and slightly smaller than the intermediate ones. *Male spadix* slender, simply branched, sparingly and thinly rusty pulverulent in every part, elongate flagelliform but not clawed at its upper end; it springs erec from near the base of its leaf-sheath which is rather deeply impressed by the base of the lowest spathe; it is about 1 m. long and terminates in a small tail-like flattened minutely prickly appendage, and has six partial inflorescences; upper primary spathes elongate, closely sheathing, minutely scabrid and moreover armed with a few large prickles; the lowest spathe is slightly flattened, very obliquely truncate, conspicuously ciliate-bearded at the mouth and produced into an elongate, triangular, subulate point; below, the spathes gradually narrow into the axial part, which is flattened, has acute margins, and is smooth or occasionally sparingly prickly externally; the lowest spathe is similar to the upper ones but larger, 17 cm. long and 6 mm. broad, more flattened and with sharp edges armed with a few long straight spines. The partial inflorescences spring erect from inside the mouth of their respective spathes, are long, slender and nodding: the lowest is about 25 cm. long, and carries 6–7 spikelets on each side: the others are somewhat shorter, and have fewer spikelets; secondary spathes smooth or slightly scabrid, tubular in their lower part, split open above into an auriculiform acuminate limb, ciliate-bearded at the margins; the spikelets are short, spring erect from inside their respective spathes, and are distinctly scorpioid: the lowest and largest are 20—25 mm. long, with two somewhat unilateral series of 12—15 flowers each; the upper spikelets diminish gradually, though only slightly, in size; spathes hairy, furfuraceous, very approximate, concave, bracteiform, produced at one side into a triangular spreading point subtending its own flowers; involucre also striately veined, slightly concave, deeply bilobed, or as if it were formed by two sub-triangular acute bracts united by their bases. *Male flowers* ovoid, very acute, of a firm cartilaginous texture; the calyx hard and callous at the base, divided down to about the middle into three semi-ovate, acute, strongly striately veined lobes; the corolla a third longer than the calyx, its segments ovate-lanceolate, acuminate, sharply striately veined.

HABITAT.—West coast of Sumatra at Benkulen. The type specimen in the Buitenzorg Herbarium. Collector unknown. Native name, "Rotan Sabut."

OBSERVATIONS.—Apparently related to *C. scaberrimus*. Well characterized by the leaf-sheaths which are very scabrid, and moreover armed with peculiar triangular, ascendent spines; by the short epetiolate cirriferous? leaves having very few spathulate, 5-costulate leaflets (bald and smooth on both surfaces); by the slender, simply branched, elongate, flagelliform spadices, terminating in a short caudiculate (not clawed and cirriform) appendage, and with remote partial inflorescences inserted

inside their respective spathes; by the elongate, scabrid spathes bearded at the mouth; by the slender elongate nodding partial inflorescences with ear-like spathels and several short scorpioid spikelets bearing closely packed biseriate subsecund male flowers. The spadix resembles that of *C. leptospadix.*

SUPPL PLATE 30.—Calamus benkulensis *Becc.* The entire type specimen in the Buitenzorg Herbarium.

112. CALAMUS RHOMBOIDEUS BL.

DESCRIPTION.—A specimen collected by *J. Hewitt* in N.-W. Borneo on the Barram River in September 1907 (Herb. Kew.), represented by a portion of a leaf from an adult plant and by the end of a branchlet (partial inflorescence) with mature fruits, apparently belongs to *C. rhomboideus.* The leaf rachis is very minutely and closely scabrid (perhaps tomentose at first), rather powerfully and irregularly clawed below; the leaflets are very rigid, almost glossy on the upper and dull on the lower surface: the apex is ciliated: they are 20–25 cm. long, 7·5-8 cm. broad, narrowing to a slender and symmetrical base and are 7-costulate. The spathes of the branchelet (secondary spathes) are tubular, elongate-infundibuliform, 2–3 cm. long, unarmed, with a dull minutely puberulous, papillose surface; the spikelets inserted just above the mouth of their respective spathes with a rather distinct axillary callus, spreading or recurved: the lowest of those present are 5 cm. long and have 7 flowers on each side; spathels short, asymmetrically infundibuliform, truncate and entire at the mouth, puberulous, papillose, very slightly produced and obtuse on the outer side; involucrophora slightly emerging from their respective spathels, cupular; involucre cupular, immersed in the involucrophorum, entire; areola of the neuter flower not very conspicuous, lunate, almost hidden by the edge of the involucrophorum. *Fruiting perianth* pedicelliform. *Fruit* relatively large, broadly ovoid-elliptical, conspicuously beaked, 26–28 mm. long (not including the beak and the perianth) and 23 mm. broad; the beak slender, terete, about 3 mm. long; the pericarp thin, yet rigid; scales arranged in 21 longitudinal series, exactly rhomboidal, broader than long, of rather dull and uniform dirty straw colour, blunt or not produced at the apex, very narrowly and not deeply grooved along the centre, the edges very narrow, entire. *Seed* globose-obpyriform, narrowing towards a rather acute base: one is 21 mm. long by 15 mm. broad and 14 mm. thick, enveloped by an adherent, once fleshy integument, deeply pitted on the surface; chalazal fovea indistinct; albumen narrowly ruminate; embryo conspicuous, almost in the centre of one of the faces.

OBSERVATION.—A specimen collected in Borneo by *Teijsmann* (No. 16335 in the Buitenzorg Herbarium) in the residency of Pontianak or Sambas, I think, as the precise locality is not stated—Malayan name "Rotang Dudoor"—probably belongs to a variety of *C. rhomboideus.* The specimen consists of the terminal part of a young plant with a few leaves. *Sheathed stem* apparently 10–12 cm. in diameter. *Leaf-sheaths* thinly tomentose; petiole 40–45 cm. long, terete but very narrowly grooved on the upper surface, 3-4 mm. in diameter, irregularly armed with a few rather

robust claws and covered with a thin greyish tomentum; *rachis* also more or less thinly tomentose-furfuraceous, very sparingly clawed on the under surface, the salient angle above acute towards the upper end; leaflets 14–17 cm. long, 4·5–5 cm. broad, 5–7-costulate, dull on both surfaces, paler underneath, produced at the apex into an acuminate tail-like bristly-ciliate tip; the margins bear also on their upper third part rigid cilia that are deciduous in older leaflets. This specimen is very similar to *C. tomentosus* var. *korthalsiæfolius* in the size and form of the leaflets, but the petiole is very elongate and grooved on its upper surface, a character probably depending upon the youth of the plant from which the specimen was gathered. I advance the opinion that the true home of *C. rhomboideus* may be not Java (where it has not been found by any of the modern collectors), but Borneo. *C. rhomboideus*, *C. tomentosus* and *C. Blumei* are three closely related, but apparently distinct species. *C. tomentosus* of the Malayan Peninsula has fruits considerably smaller than those of the other two. *C. rhomboideus* has larger ovoid fruits; *C. Blumei* has also large fruits but nearly spherical.

SUPPL. PLATE 31.—Calamus rhomboideus *Bl.* The entire specimen described above, in the Kew Herbarium.

113. CALAMUS TOMENTOSUS Becc. Add:—*C. rhomboideus* (non Bl.?) Ridley, Mat. Fl. Mal. Penins. ii, 194.

DESCRIPTION.—Ridley has referred *C. tomentosus* Becc. to *C. rhomboideus* Bl., but as I have stated (p. 339 of this volume) the reasons that induced me to consider the Malacca plant different from the Javan, and as no new material of the latter has been added to that already known, the specific identity of the two, although possible, as I have already supposed, remains still uncertain. I have seen a specimen of *C. tomentosus* in fruit, which as to the leaves approaches more to the varieties *korthalsiaefolius* and *intermedius* than to the typical form. I am moreover uncertain if these varieties represent vegetative and non-permanent variations, or if they are hereditary forms or sub-species of *C. tomentosus*.

The specimen mentioned above was sent to the Herbarium of the British Museum by Mr. Ridley, and was collected at "Sungei Ujong" (probably by Cantley's collector); almost certainly it is a specimen of this same gathering that Mr. Ridley has used for the description of the fruit of *C. rhomboideus* in his "Materials."

The specimen consists of the terminal portion of a leaf and of a partial inflorescence with mature fruits. The leaf is very much like that of *C. Blumei*, reproduced in plate 137; the leaflets however are not slightly asymmetrical at their bases. The leaf-rachis is very minutely scabrid, and is armed with scattered or geminate claws; the leaflets are regularly rhomboid, apiculate, 17–19 cm. long, 7–9 cm. broad, shortly ansate, symmetric, and with a distinct axillary callus at the base, 5-sub 7-costulate; the margins and the apex are quite glabrous (perhaps the cilia are deciduous). The partial inflorescence is 30 cm. long and has 5 recurved spikelets on each side, inserted just above the mouth of their spathes; the lower spikelets are

6–7 cm. long, have 7–8 flowers on each side: those of the upper end are shorter, 4–5 cm. long, and have 5–6 flowers on each side; the flowers are 8 mm. apart in each series; secondary spathes tubular, elongate-infundibuliform, slightly tomentose; spathes glabrescent (perhaps once tomentose), tubular-infundibuliform, 4 mm. long, truncate, produced at one side into a short triangular, bluntish, spreading point; involucre cupular, entire or slightly bidentate on the side of the areola of the neuter flower; the areola itself is distinctly lunate and sharply edged. *Fruiting periauth* hardened, pedicelliform, terete, 3 mm. broad, and about as long. *Fruit* globular ovoid, equally rounded at both ends, but surmounted by a conspicuous terete very narrow beak, 3 mm. long, 1 mm. thick, and crowned by 3 small subcircinate stigmas; the fruit without the beak and the perianth is 18–19 mm. long and 16–17 mm. broad; the pericarp is thin and very fragile; scales uniformly brown, dull, exactly rhomboidal, broader than long, arranged in 18 longitudinal series; they have a very narrow, scarious, very finely ciliolate-denticulate margin, are very narrowly and faintly grooved along the centre, and are marked towards the bluntish and not produced tip with faint concentric rings. *Seed* ovoid, 13 mm. long, 9·5 mm. broad, minutely closely and deeply pitted when it is divested of the adherent, once fleshy integument; chalazal fovea punctiform, in the centre of the raphal side; embryo on the antiraphal side below the middle; albumen deeply ruminate. The female spikelets of the "forma typica" in flower are shorter than those of the fully developed and fruit-bearing specimen described above; further these spikelets have the spathels more elongate, and more distinctly tubular-infundibuliform.

SUPPL. PLATE 32.—Calamus tomentosus *Becc.* Ridley's specimen from Sungei Ujong in the Herbarium of the British Museum.

114. CALAMUS BLUMEI Becc.

DESCRIPTION.—Specimens with fruits of this beautiful, but as yet very imperfectly known species, have been collected by *Hallier* in Dutch N.-W. Borneo at Liang-gagang (No. 2786 in Buitenzorg Herbarium). These specimens, which differ from the typical one only in having larger leaflets, confirm the specific diversity of *C. Blumei* from *C. rhomboideus.* Hallier's specimens have the *sheathed stem* 15–18 mm. in diameter. The *leaf-sheaths* are exactly like those of *C. tomentosus*, very minutely scabrid, rather strongly gibbous-plicate above, thick in texture and almost woody, armed, chiefly on their upper part, with short pustule-like spines, which rise as small ascendent pungent points from the centre of very broad swollen mammiform bases. The *leaves* appear from the fragments seen by me to be rather large; the petiole, at the base, is almost terete, about 1 cm. in diameter; the rachis is armed underneath in its lower portion with solitary robust claws; higher up and towards the upper end the claws are smaller and ternate; leaflets alternate and distant, exactly like those figured in plate 137 in outline, but twice as large (or at times even more), acute or more or less distinctly ansate at the base, rigid-papyraceous: the lower ones 30–35 cm. long, and as much as 18 cm. broad: those of the apex 26–27 cm. long, 15·5–16 cm. broad: almost glossy on both surfaces, 7–8 costulate, the mid-costa somewhat excentric. *Female spadix* simply decompound, with several partial inflorescences, and terminating in a slender, not very elongate, clawed flagellum; primary spathes (only those of the upper

part of the spadix seen by me) tubular, thinly coriaceous, strictly sheathing, armed with several very small claws, obliquely truncate at the mouth; partial inflorescences inserted above the mouth of their respective spathes with a distinct axillary callus; those of the upper part of the spadix 20–30 cm. long, and with 4–5 spikelets on each side; secondary spathes elongate-infundibuliform, 2–2·5 cm. long, flat and with sharp edges at their bases on the inner side, smooth or occasionally furnished with very few straggling rudimentary claws, obliquely truncate, entire and smooth at the mouth, produced at one side into a short triangular acute point; spikelets inserted just above the mouth of their respective spathes, the lowest of each inflorescence 6–7 cm. long, the upper somewhat shorter, curved, all kept deflexed by a very conspicuous axillary callus: their axes thickish, subterete, closely sinuous; the largest spikelets have 8–10 flowers on each side, the flowers are therefore rather approximate: spathels short, asymmetrically infundibuliform, truncate and entire at the mouth, obtuse or shortly apiculate on the outer side; involucrophorum almost entirely immersed within its own spathel, shallowly cupular; involucre not exceeding the involucrophorum and moulded on this, coriaceous, almost glossy inside, entire or obscurely crenulate; areola of the neuter flower lunate, sharply edged. *Fruit* relatively large, spherical, 20–22 mm. in diameter, conspicuously beaked; the beak slender, subterete, about 3 mm. long; the pericarp very thin, yet resistent; scales arranged in 18 longitudinal series, broader than long, bluntish or obtusely apiculate, dull, of a uniform light umber-brown colour, with a very narrow, slightly darker margin, very narrowly and neatly grooved along the centre. *Seed* ovoid, very obsoletely 3-gonous, obtusely apiculate, 14 mm. long, 10–11 mm. broad, enveloped by an abundant, once fleshy integument, pitted on the surface; the chalazal fovea indistinct; embryo in the centre of one of the faces; albumen deeply ruminated. *Fruiting perianth* very shortly pedicelliform. The spathes and spathels are covered with a thin, partially-deciduous, rusty-furfuraceous coating.

HABITAT.—Dutch N. W. Borneo: Liang-gagan, *Hallier* No. 2786 in Buitenzorg Herbarium.

SUPPL. PLATE 33.—Calamus Blumei *Becc.* Portion of the sheathed stem; leaflet; branchelet with mature fruits. From Hallier's No. 2786 in Buitenzorg Herbarium.

118. CALAMUS SYMPHYSIPUS Mart.
Calamus sp. indet. L., Koord. Verslag. Fl. N. O. Celebes, 292.

OBSERVATIONS.—This species which was long known only from the specimens collected by Labillardière has been found again by Dr. Koorders in Celebes, in the Province of Minahassa; to it belong the following numbers, all preserved in the Buitenzorg Herbarium: No. 18411 β with mature fruits, without precise locality; No. 18412 β, in the same region near Kajuwatu, vern. name "Pondos Embel.;" No. 18409 β and No. 18403 β near Paku ure. This last specimen is sterile and apparently belongs to a young plant; the sheathed stem is 2 cm. in diameter, the leaf-sheath is dull and is armed with small, light coloured, laminar, elongate-triangular spines which are 5–7 mm. long and 3–4 mm. broad at their bases, and are more or less either approximate or

confluent and subseriate. Koorders' specimens exactly agree with the typical ones and like these have the leaflets subochraceous on the under surface.

118*a*. CALAMUS KOORDERSIANUS Becc. n. sp.

Calamus sp. indet. D, Koord. Verslag Fl. N. O. Celebes, 1898, p. 291.

DESCRIPTION.—Scandent and large. *Sheathed stem*...... *Leaf-sheaths*......... *Leaves* large; leaflets equidistant, very regularly set, 3–3·5 cm. apart, narrowly ensiform (those seen by me apparently belonged to the intermediate portion of the rachis) 73 cm. long, 2·5 cm. broad, narrowing a little towards the base, and very gradually long acuminate from below the middle to a subulate and at the sides finely ciliate tip; they are almost glossy above, dull and slightly paler underneath, rather firmly papyraceous, very distinctly 3-costulate, or even 5-costulate, for besides the 3 costae, which are very prominent on the upper surface, a secondary rather distinct nerve runs in very close proximity to each margin; tranverse veinlets very numerous and fine and like the costae, more distinct on the upper than on the lower surface; the mid-costa is considerably stronger than the side costae, and on the upper surface is very sparingly bristly-spinulous but only near the apex, while one of the costae on each side of it is furnished with long fulvous bristles; underneath the side costae are smooth, and the mid-costae conspicuously bristly; margins distinctly and spreadingly ciliate. *Male spadix*.... *Female spadix* apparently large and elongate, and probably provided with a long terminal clawed flagellum, but the specimen seen by me consists of only a partial inflorescence with a portion of the axial part; the latter is robust, obsoletely angular, 6–7 mm. thick, very powerfully armed externally with small rows of 3–4 confluent, very robust, black, broad-pointed claws; the partial inflorescence has a generally scorpioid aspect and is 33 cm. long; its axial part is strongly arched, rigid, terete, 6 mm. thick at the base and generally narrows towards the upper end; it has 6 spikelets on each side, but with a unilateral tendency and terminates in a tail-like apex, which carries alternate single flowers. Secondary spathes tubular, very closely sheathing, unarmed, glabrous, smooth (not striately-veined) obliquely truncate and smooth at the mouth, produced at one side into a triangular acute or acuminate point; spikelets inserted above the mouth of their respective spathes, arched, spreading or recurved, with their axial part terete, 2·5 mm. thick; the lower and largest spikelets are 9–10 cm. long and have 10–12 flowers on each side; spathels tubular, cylindrical, closely sheathing, horizontally-truncate, and naked at the mouth, briefly apiculate at one side. The *flowers* (*female*) 7-8 mm. apart on each side, borne by a distinct thickish neck-like or pedicelliform involucrophorum, attached to about the middle of the spathel above its own, and having a distinct axillary callus; it is about 2 mm. long, terete, and about 1·5 mm. thick at its base, but broadens slightly above into a short truncate limb; involucre exserted from the involucrophorum, discoid, flat, entire; areola of the neuter flower depressed. *Fruiting perianth* shortly but distinctly pedicelliform, terete, broader than high (3·5 mm. broad, 2 mm. high) formed by the tube of the hardened calyx, which has the limb irregularly split; the corolla about as long as the calyx, its segments triangular, smaller than the lobes of the calyx. *Fruit* spherical with a short and broadly conical beak, about 15 mm. in diameter; scales arranged in 18 longitudinal series,

about as long as broad, narrowly grooved along the centre especially in the posticous part, straw coloured with a narrow black edge all round, the point obtuse or very slightly produced, and with the margins very densely fringed with very minute black cilia. The fruit apparently contains normally 2 *seeds* which are enveloped by an abundant integument, probably once fleshy. When freed from the integument the seeds appear flattened, very irregular and angular, 8–10 mm. long, 3·5–4 mm. broad, with a polished mahogany-red surface; the chalazal fovea is very small and punctiform; albumen bony, homogeneous; embryo basal.

HABITAT.—N. E. Celebes: Prov. of Minahassa near Kajuwatu, discovered by *S. H. Koorders*, 27th Feb. 1895. No. 18400β. Vernacular name: "Pondos-ajamen."

OBSERVATIONS.—I have seen a small fragment of a leaf with a few leaflets only, and also a partial inflorescence with fruits. It appears, however, to be a well characterized species, not closely related to any one of those known to me, that belong to the group having scorpioid inflorescences, and flowers borne on a pedicelliform involucrophorum; it is also distinguishable by its long and narrow distinctly 3-costulate ensiform leaflets; by the axis of the spadix being very powerfully armed with black-tipped claws; by the arched scorpioid partial inflorescences having smooth spathels; by the arched rigid spikelets with tubular cylindrical spathels, and remote pedicellate flowers and fruits; by the fruits being spherical containing two seeds and having scales densely fringed with short black hairs, and by the seeds being flattened, angular, not ruminate, and with a basal embryo.

SUPPL. PLATE 34.—Calamus Koordersianus *Becc.* Portion of a leaf; a partial inflorescence with mature fruits. The entire type specimen in the Buitenzorg Herbarium.

119. CALAMUS CUMINGIANUS Becc. Add:—Becc. in Webbia di. U. Martelli, i, 346.

119*a*. CALAMUS MEGAPHYLLUS Becc. n. sp.

DESCRIPTION.—Not high scandent. *Sheathed stem* about 3·5 cm. in diameter. *Leaf-sheaths* thick, woody, obliquely truncate and smooth at the mouth, and having a very short, hard, glabrous ligula, conspicuously gibbous above, dull, obsoletely-striate, and covered with very small, confluent, thin scales which form an evanescent grayish coating, otherwise quite smooth or sometimes with a few small spines on the upper part of their ventral side. *Leaves* 1 m. long or thereabout in the pinniferous part, and terminating in a cirrus as long or even longer; petiolar part 15 mm. broad, almost obsolete, the leaflets extending very nearly to the mouth of the leaf-sheaths; the rachis on the upper surface is convex from the base up to about the middle, and armed with short straight prickles on the remainder: it is bifaced with a smooth not very sharp salient angle; on the under surface the rachis is almost flat in its lower part and armed on the edges with very small brown claws and with a line of similar small claws along the centre; the claws however become stronger higher up, and finally near the end are geminate and ternate; the cirrus is peculiarly and densely armed all over its lower surface with very approximate, often

more or less confluent but not verticillate, very sharp, dark brown claws. *Leaflets* very few and very large, 14 on the whole (in one leaf), irregularly approximate into 3-4 groups, with long vacant spaces interposed between the groups, and 3–6 cm. apart between themselves on each side; they are concavo-convex, papyraceous, thin and tough, not rigid, almost glossy, similarly green and quite destitute of hairs or spinules on both surfaces, oblong-spathulate and gradually tapering from above the middle to a rather acute base, while above narrowing rather suddenly to a broadly triangular, acute, not bristly tip; they have 4–5 almost equal, slender, sharp, smooth main costae, and several very slender secondary nerves; transverse veinlets extremely numerous and approximate (2–3 in a millimetre), pellucid, very continuous, very slender, but very sharp on both surfaces; the intermediate and largest leaflets are 35–45 cm. long and 8–10 cm. broad : the upper ones somewhat shorter: the lowest very small *Male spadix*......*Female spadix* rather elongate (1·20 m long, *Elmer*) recurved or pendulous, rather slender, simply branched or with few distant small undivided partial inflorescences, probably subflagelliform at its upper end (this part not seen by me); primary spathes tubular, slightly enlarged and rather loosely sheathing above, about 20 cm. long, obliquely-truncate at the mouth, and produced at one side into a broadly-triangular acute point: they have a dull finely-striate surface, and are very sparingly prickly in their upper part, especially on their superficial, dorsal keel; the lowest spathe has a partial inflorescence like the upper ones, and is very similar to these, but it is rather acutely bicarinate; partial inflorescences inserted just at the mouth of their respective spathes: they are arched, above 12 cm. long, and carry 5–7 gradually diminishing spikelets on each side; secondary spathes with a terete, solid, axial part, and suddenly expanded into a loose, infundibuliform, truncate, ciliolate limb, slightly apiculate at one side; spikelets inserted far above the mouths of their respective spathes, arched-subscorpioid; the lower spikelets are 2·5–3 cm. long, and have 12–14 flowers on the whole, arranged in two assurgent series; the uppermost spikelets have 4–5 flowers only; spathels briefly infundibuliform; involucrophorum disciform, borne on a short neck or subpedicel inserted laterally at the base of the spathel above its own; involucre with a conspicuous, orbicular, flat scar, edged by a narrow circular limb; areola of the neuter flower punctiform, inconspicuous. *Fruiting perianth* briefly but distinctly pedicelliform, about 2 mm. long and broad. *Fruit* exactly spherical, 13 mm. in diameter, with a very small beak abruptly rising on the convex top; scales in 15 longitudinal series, very thin, glossy, slightly convex, very faintly grooved along the centre, straw-coloured passing into reddish-brown at the edges, their points slightly produced, narrowly scarious and erosely toothed. *Seed* enveloped by a copious, fleshy, sour integument, orbicular, 7 mm. in diameter, even surfaced, flattened, plano-convex or sublenticular, flat on the raphal side with a central pit like chalazal fovea. Albumen equable. Embryo basal.

HABITAT.—The Philippines: Island of Mindanao, district of Davao, on Mount Apo at 1,000 m. on the Talon side of the mountain range in open light-wooded ridges, *Elmer*, No. 11878, Sept. 1909; native name "Linlokan."

SUPPL. PLATE 35.—Calamus megaphyllus *Becc.* Portion of the sheathed stem; intermediate portion of a leaf, and another portion with its terminal cirrus; portion of the fruiting spadix. From Elmer's No. 11878 in Herb. Beccari.

OBSERVATIONS.—It is certainly related to *C. Cumingianus*, but the female flowers of *C. megaphyllus* are supported by an involucrophorum very briefly pedicelliform, while that part is elongate and very conspicuous in *C. Cumingianus*. In the structure of the female spadix it approaches also *C. Minahassae*, but it is easily distinguishable from that species, as from almost all others species, by its very large, oblong-spathulate leaflets, very closely marked by innumerable sharp transverse veinlets.

122. CALAMUS ADSPERSUS Bl.

Add to the localities:–Java: Tenger, coll. Kobus (*Koorders* Nos. 19944β, 32261β, 19943β); Residency Besuki, Pantjur-Indjen, 1500—1700 m., vern. name "Pandjaling Pan" (*Koorders* without number); Residency Semarang, Gunong Telomojo, 1300 m. elev. (*Koorders* No. 35994β).

124. CALAMUS MINAHASSAE Warb.

Add to the localities:—Celebes: Prov. Minahassa (Menado) (*Koorders* No. 18405β, and No. 18414β).

124*a*. CALAMUS MITIS Becc. in Philip. Journ. Sc. iii, (1908), 341.

DESCRIPTION.—Slender, scandent. *Sheathed stem* 15 mm., in diameter, naked canes about 8 mm. in diameter. *Leaf-sheaths* gibbous above, greenish, thickly coriaceous, glabrous or very slightly and fugaciously furfuraceous, quite unarmed (always?), obliquely-truncate and smooth at the mouth. *Ocrea* very short, or almost obsolete. *Leaves* cirriferous, the pinniferous part short, (35–40 cm. long) in 2 specimens; petiole almost wanting, the lowest leaflets being attached very near the mouth of the sheaths; rachis obscurely trigonous, smooth on the upper obtuse angle, armed underneath with small, solitary, scattered claws; the cirrus slender, about as long as or not much longer than the pinniferous part, closely armed with very many solitary, or more or less irregularly confluent (non-whorled) claws. *Leaflets* very few (5–6), irregularly and remotely alternate on each side of the rachis (not grouped nor approximate in pairs), elongate-elliptical or oblanceolate-elliptical (or oblong-subspathulate, slightly concavo-convex, cuneately attenuate to an acute base: the intermediate ones 20–24 cm. long, 5·5–6·5 cm. in width at their broadest part (in the middle or slightly above), rather suddenly contracted at the summit into an acuminate not or very slightly bristly tip, papyraceous, green, dull, subconcolorous and glabrous on both surfaces: they have 5 primary nerves or costae, all reaching the apex, quite smooth and almost equally prominent on both surfaces; transverse veinlets very sharp, especially on the upper surface, numerous, approximate, subparallel and continuous; margins acute, furnished with very remote and very small appressed inconspicuous spinules. *Male spadix*.........*Female spadix* erect, rigidulous, slender, simply decompound, 0·85–1 m. long, inclusive of a slender, non-clawed, tail-like, 10–12 cm. long, terminal appendage; the spadix is inserted not far below the mouth of its sheath and has a very few (2–3) partial inflorescences on its upper part; primary spathes tubular, elongate, not very tightly sheathing, more or less covered with a thin, detachable, and partly deciduous ferrugineous indumentum; the lowest

spathe is 7–8 cm. long, slightly compressed and obscurely 2-keeled, truncate at the mouth, armed with a few very small spines on the sides near its base, otherwise smooth; the 2–3 following spathes do not bear inflorescences, are longer than the first, cylindraceous, also obliquely truncate at the mouth, smooth or with a line of very small claws on the outer side especially near their summit or even are quite smooth; the upper spathes are prolonged at the summit into a very short triangular point and often split there on one side; partial inflorescences inserted at or a little below the mouth of their respective spathes, small, simple-branched, not scorpiod, 6–8 cm. long, with 5-6 alternate, distichally inserted, gradually shortening spikelets on each side of the short, straight, rather rigid, main-axis; secondary spathes infundibular, rather loosely sheathing, truncate, entire and glabrous at the mouth, slightly apiculate at one side; spikelets slender, slightly arched, non-scorpioid, inserted just at the mouth of their spathes, not distinctly callous in the axilla: the lower and larger are about 3 cm. long and have about 10, very regularly set, bifarious flowers on each side: the others are gradually slightly shorter and have fewer flowers; spathels shortly asymmetrically infundibuliform, with a broad spreading limb which subtends the involucrophorum; the latter inserted just at the mouth of its spathel at the base of the one above, very shortly stalked, orbicular, flat or discoid, non-callous at the axilla; involucre very slightly exceeding the involucrophorum, discoid, orbicular or very obsoletely 2-toothed on the side of the neuter flower, of which the areola is depressed, obsolete, but with a small tuberculiform scar in its centre. *Fruiting perianth* very shortly pedicelliform; the calyx slightly callous at the base, parted halfway down into 3 semiovate lobes; the segments of the corolla acute, about as long as the calyx. *Fruit* globose, small, 9–10 mm. in diameter, surmounted by a small, slender, almost cylindric beak 1·5 mm. long; scales in 16–18 series, broadly rhomboidal, of a dirty straw-yellow colour, dull, almost flat, subsquarrose or not very appressed, very faintly and narrowly grooved along the centre, with a very narrow discoloured or sometimes reddish margin, tip not prolonged, obtuse, usually red-brown. *Seed* globular, 7 mm. in diameter, very slightly compressed; it has a small round deep chalazal fovea in the centre of the raphal side, and is covered with a thinly crustaceous (once fleshy) integument, otherwise it has an even, not pitted surface; albumen equable; embryo basal, very near the hilum.

Habitat.—The Philippines: Bubayanes, Camiguin Island (No. 4075, Herb. Bur. Sc. Manila); Batanes, Batan Island (No. 3817, Herb. Bur. Sc. Manila), collected by *E. Fenix* in fruit, June 1907. The fruit is said to be white and edible.

Observations.—In the shape of the leaflets it somewhat resembles *C. Cumingianus*, but its affinities are with *C. Minahassæ*.

Suppl. Plate 36.—Calamus mitis *Becc.* Portion of the stem with a leaf and an entire spadix in fruit. From No. 4075, Herb. Manila in Herb. Becc.

125*a* Calamus Elmerianus Becc. in Elmer, Leaflets Philip. Bot. ii. (1909), 647.

Description.—Scandent. *Sheathed stem* 15–18 mm. in diameter. *Leaf-sheaths* dark-green, rather densely set with slender light coloured spines. *Leaves* cirriferous 0·50–1 m. long in the pinniferous part, with few inequidistant leaflets; petiole obsolete or

nearly so; rachis armed underneath, towards its upper end, with usually solitary claws along the centre, and with others much smaller at the sides, all having a light-coloured base, and a black tip; on the upper surface the rachis has a salient angle, spinulous on its lower portion; the terminal cirrus is slender and very densely armed with small, single (not in half-whorls), very sharp claws. *Leaflets* alternate or more or less approximate in pairs on each side of the rachis, papyraceous, rigidulous, dark green on the upper, and very slightly lighter on the lower surface, more or less concavo-convex, oblong-lanceolate or elliptical-lanceolate, or oblanceolate, 15–25 cm. long. 3–6·5 cm. broad: the lower smaller, the basal pair being much the smallest: they are usually broadest above their middle and gradually narrow thence towards an acute base: near the apex they are more or less contracted into a more or less elongate, triangular and acuminate spinulous-ciliate or else quite smooth tip: they have usually 5 slender costae, which are usually smooth on both surfaces, but occasionally the mid-costa is spinulous above; transverse veinlets extremely numerous and approximate, very slender but very sharp on both surfaces; margins almost smooth or at times furnished especially near the base with a few, frequently rather elongate, rigid, slender spinules. *Male spadix*...... *Female spadix* arising a little below the mouth of the leaf-sheaths, subflagelliform, 1 m. long or thereabout and extended into a rather elongate slender tip, which is sheathed by 3–4 elongate, narrow, slightly prickly spathes; it has only 2–4 remote partial inflorescences; primary spathes elongate, the lowest strongly flattened; the upper ones cylindraceous, rather closely sheathing, finely striate longitudinally, thinly coriaceous, green, narrowing a good deal in their lower portion to a very slender axial part, more or less armed with small scattered prickles, obliquely truncate and glabrous at the mouth, and prolonged at one side into a triangular acuminate point; partial inflorescences inserted near or somewhat above the mouth of their respective spathes, arched subscorpioid, small, 8–12 cm. long, with 6–8 slightly assurgent spikelets on each side; secondary spathes narrowly tubular-infundibuliform, horizontally truncate, entire and smooth at the mouth; spikelets inserted at or a little above the mouth of their respective spathes, small, slender, the lowest (largest) are 2·5–3 cm. long, have 10–11 flowers on each side; the others shorten gradually and have fewer flowers; spathels suddenly broadening into an open infundibuliform limb, at first slightly furfuraceous, later glabrous, obscurely produced at one side into an obtuse point; the involucrophorum is not pedicelliform, but has a very short neck, which suddenly expands into a narrow suborbicular limb; involucre very slightly concave with the conspicuous orbicular scar left by the fallen flower bordered by a circular or obsoletely angular limb; the areola of the neuter flower is represented by a small tubercle. *Female flowers* very small, 3 mm. long, ovoid; the calyx parted down to about the middle into 3 semi-ovate, acute, strongly striately veined lobes; the segments of the corolla as long as the calyx. *Fruiting perianth* short, but distinctly pedicelliform. *Fruit* globose-ovoid,* about 13 mm. broad, very suddenly and distinctly surmounted by an obtuse cylindrical beak; pericarp very thin and brittle; scales very small, arranged in 21 longitudinal series, squarrose, flattish, not grooved along the centre, of a dirty straw colour with lighter margins and with a reddish-brown erosely toothed point. *Seed* globular-ovoid, 7 mm. long slightly rugose-pitted and with a central, orbicular, rather deep chalazal fovea on the slightly flattened raphal side; albumen equable; embryo basal.

HABITAT.—The Philippines. The type specimen was collected by *Elmer* (No. 9298 in Herb. Beccari) in Luzon at Lucban, Prov. of Tayabas, in dry woods at 800 m. Found afterwards in Mindanao also by *Elmer* (No. 11756 in Herb. Beccari) in the district of Davao, on a slightly-wooded ridge at about 1140 m. near the junction of the Baruring River with the Calan Creek. I consider No. 7289 (in Herb. Beccari) collected by *E. D. Merrill*, also in Mindanao at Agusan River, Butuan sub-province, to be conspecific with the above.

OBSERVATIONS.—*C. Elmerianus* is closely related to *C. mitis* of the Babuyanes Islands, from which it differs in having the leaf-sheaths armed with slender flexible spines (in *C. mitis* the leaf-sheaths are quite unarmed); especially in the thinner pericarp of the fruit; in the more numerous and more distinctly squarrose scales and in the slightly rugose-pitted surface of the seed.

C. Elmerianus seems to be a variable plant as to the arrangement of the leaflets along the rachis. In the type specimen the leaflets are distinctly approximate in pairs on each side of the rachis, and the pairs are separated by long vacant spaces; in Elmer's No. 11756 from Mindanao this disposition is less apparent, and in Merrill's No. 7289 the leaflets are only irregularly alternate on each side of the rachis. Moreover in No. 11756 from Mindanao the leaflets bear on the margins, specially in their lower part, a few unequal, light coloured, very slender spines, of which some attain 5–6 mm. in length, but usually are shorter; the leaflets have also the mid-costa often spinulous on their upper surface, and the tip smooth In Merrill's No. 7289, also from Mindanao, the leaflets have quite smooth margins and the mid-costa is only spinulous above near the base.

Both *C. mitis* and *C. Elmerianus* approach *C. Minahassæ* from Celebes.

SUPPL. PLATE 37.—Calamus Elmerianus *Becc.* Portion of a leaf and partial inflorescence with fruits. From the type specimen Elmer No. 9298. Portion of the sheathed stem with the basal part of a leaf and of a spadix. Female spadix in flower.

127 *a*. CALAMUS WARI-WARIENSIS Becc. n. sp.

DESCRIPTION.—A slender climber. *Sheathed stem* 12–15 mm. in diameter; internodes elongate; naked canes about 8 mm. in diameter. *Leaf-sheaths* thickish, greenish and thinly covered with a rusty-furfuraceous indumentum, armed lower down with rigid bristles or with more or less confluent and shortly seriate or else scattered spiculiform spinules, which have light tuberculiform bases; in the upper part the sheaths have the spiculae gradually transformed into very dark, glossy, rigid, elongate bristles, which are more densely set near the mouth and entirely cover the ligule; the latter is really liguliform, about 4 cm. long, and is opposed to the petiole. The *leaves* are 60 cm. long in the pinniferous part, and non-cirriferous; the petiole is elongate, about 20 cm. long and 5 mm. broad, flattened and plano-convex, armed on the upper surface with numerous, small, erect prickles, and on the acute margin and along the centre of the dorsum with small claws. *Leaflets* numerous, equidistant, 18–20 mm. apart, linear, very narrow, 15–18 cm. long, 8–10 mm. broad, very acuminate, almost uniformly green, with 3 very slender costulae which are bristly on the upper surface and quite smooth underneath; margin remotely spinulous; transverse veinlets prominent

much interrupted; rachis rather closely armed with a line of simple claws along the centre of the dorsum, and with a similar line on each margin. *Male spadix.* . . *Female spadix* elongate, partially supradecompound with few (3–4) superposed, rather distant, partial inflorescences; it is probably flagelliferous at its upper end, but the only one seen by me is without its apical portion; primary spathes elongate, tubular, the lowest about 25 cm. long and 7–8 mm. broad, closely sheathing, strongly flattened in its lowest, slightly so in its upper part, pervious at its upper end, and bristly ciliate at the apex, densely beset with rigid, blackish bristles which rest on a swollen base; upper primary spathes more loosely sheathing than the lowest, slightly broadening in their upper part, terminating in a short triangular point, sparsely armed with very small hooked prickles. The partial inflorescences are paniculate, and in their lower portion have 1–2 compound or branched spikelets on each side, and simple gradually diminishing spikelets above; the lowest inflorescence is about 12 cm. long, has 2 branched and 4–5 simple spikelets on each side; the other inflorescences are somewhat shorter and have fewer spikelets; secondary spathes are narrowly infundibuliform, not very tightly sheathing, unarmed, fugaciously furfuraceous, truncate and ciliate at the mouth, produced at one side into a triangular very acute or acuminate point; spikelets 1–3 cm., long with 4–8 not very crowded, ascendent, almost erect flowers on each side: their axis slender, angular, zig-zag sinuous, puberulous and rusty furfuraceous; spathels narrowly infundibuliform; involucrophorum slightly protruding beyond its own spathel, disciform, subpedicellate; involucre almost on a level with the involucrophorum, orbicular, almost flat and disciform; areola of the neuter flower not sharply defined, but the insertion of the flower marked by a small distinct tubercle. *Female flowers* ovoid, acute (in bud), 3 mm. long; the calyx very shortly 3-toothed and finely striately veined. *Neuter flowers* about as long as the female but considerably thinner and of a quite different form; the calyx cyathiform; the corolla at least twice, at times almost 3 times, as long as the calyx. *Fruit* . . . .

HABITAT.—British New Guinea: on Mount Wari-Wari, at about 1,500 m. elevation, collected by *H. O. Forbes* in 1886 (No. 741, Herb. Brit. Museum).

OBSERVATIONS.—It has the leaf-sheaths as hispid or densely bristly at the mouth as *C. barbatus*, but it does not show appreciable affinities with that species, nor with any other, except, perhaps, with *C. Cuthbertsoni*, which it resembles in the structure of its female spikelets. It is however a much smaller plant, has small leaves and very few leaflets.

The leaf-sheaths in the specimen of *C. wari-wariensis* seen by me (the upper part of a flowering stem) are not flagelliferous, and the leaves are not cirriferous although the rachis is strongly clawed. The plant however is said to be scandent. Probably the spadix ends in a flagellum, but in the available specimen the upper part of the spadix is mutilated.

SUPPL. PLATE 38.—Calamus wari-wariensis *Becc.* Sheathed stem; intermediate portion of a leaf; upper end of a plant with an entire spadix. The type specimens, Forbes No. 741 in the Herbarium of the British Museum.

128. CALAMUS SPATHULATUS var. ROBUSTUS Becc.
Add:—*C. subspathulatus* Ridley, Mat. Fl. Mal. Penins. ii, 194.

OBSERVATIONS.—Ridley raises the variety of *C. spathulatus* with larger leaves and more robust spadices to the rank of a distinct species.

129. CALAMUS MARTIANUS Becc.
This name should be replaced by *Calamus penicillatus* Roxb. Fl. Ind. iii, 781 (printed *pencillatus*), Becc. in Ann. Roy. Bot. Gard. Calc. xi, 500.
C. penangensis Ridley, Mat. Fl. Mal. Penins. ii, 192.

OBSERVATIONS.—I have seen in the Herbarium of the British Museum the authentic specimen of *C. penicillatus* Roxb., which exactly corresponds to that of Gaudichaud named by me *C. Martianus*, and which is represented in plate 151 (see observations to *C. javensis*). Ridley's *C. penangensis* is exactly Roxburgh's *C. penicillatus*.

130. CALAMUS INSIGNIS Griff.
Add:—Ridley, Mat. Fl. Mal. Penins. ii, 193 (partly).

OBSERVATION.—Ridley (l. c.) has united the "forma typica" of *C. spathulatus* Becc. to *C. insignis* Griff., and certainly several of the localities attributed by Ridley to the latter belong also to the former. I have nothing to add here to what I have already written (p. 365). In *C. insignis* the spines of the leaf-sheaths are horizontal, in *C. spathulatus* they are ascendent of a very unusual form and quite different from those of *C. spathulatus* (Compare plate 140, with plate 152).

131. CALAMUS ORNATUS var. PHILIPPINENSIS Becc. Add:—Becc. in Webbia di U. Martelli, i, 346, and in Philipp. Journ. Sc. vi, 1911, 230.

OBSERVATIONS.—Apparently a common plant in the Philippines. To the localities already given add the following:—Luzon: Unisan, Prov. Tayabas, *C. Reyes* No 2 (Herb. Manila and Becc.—specimens with female flowers, Vern. name "Limuran"); Lamao River, *Borden* No. 2489 (Herb. Manila and Becc.—with female-flowers); Lucban, *Elmer* No. 7625 (Herb. Becc.—with male flowers); Prov. Cagayan, *Curran.* No. 17252 (Herb. Manila and Becc.—with male flowers, Vern. name "Alimoran"). Basilan Island: *Hutchinson* No. 6107 (Herb. Manila and Becc.—sterile specimens). Western Negros, *Everett* No. 6089 (Herb. Manila and Becc.—in fruit). Mindoro: Bongabong River, *Merrill* No. 3913 (Herb. Manila and Becc.—Vern. name Tagaloc "Agubac"); Mindanao: Togaya, Mount Apo, *Elmer* No. 11236 (Herb. Beccari. Vern-name "Tubo"); Island of Polillo: *Robinson* No. 9266 (Herb. Manila and Beccari); *MacGregor* No. 10461, (Herb. Manila and Beccari).

CALAMUS ORNATUS var. HORRIDUS Becc.
Add:—*C. ornatus* Ridley, Mat. Fl. Mal. Penins. ii, 195, excluding *C. giganteus* Becc.

OBSERVATIONS.—Ridley has reduced, erroneously I think, *C. giganteus* Becc. to *C. ornatus* Bl. I have not seen the specimens that represent *C. giganteus* in Ridley's

Herbarium, but most certainly the type specimen of *C. giganteus*, reproduced in my plate 197, is an entirely different plant from any of the forms of *C. ornatus*. *C. giganteus* approches *C. Manan*, and perhaps corresponds to the plant described by Ridley (l. c.) under this name.

CALAMUS ORNATUS Bl. var. CELEBICUS Becc. n. var.

DESCRIPTION.—It differs from the other varieties by the fruit being more elongate, with quite black scales, but especially in the seed, which is oblong, truncate and emarginate at the base, strongly flattened with a very uneven surface; is boldly tubercled and pitted, but without crests or ribs; it is 16–18 mm. long, 10–11 mm. broad and 7 mm. thick. The fruit without the perianth measures 3 cm. in length, and is 16–18 mm. broad.

HABITAT.—Celebes: in the Province of Minahassa (Menado), *Koorders* No. 18404β near Paku ure, and Nos. 18390β, 18394β, 18402β, 18408β, in Buitenzorg Herbarium

132. CALAMUS SCIPIONUM Lour. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 195.

Add to the localities:—Sumatra: Palembang Residency, *J. A. van Rijn van Alkemade* in Herb. Martelli. Ridley gives the following additional localities in the Malayan Peninsula:—Selangor: Batu Tiga, *Curtis*; Kwala Lumpur *Ridley*.

OBSERVATIONS.—Ridley writes: "A plant in the Botanic Garden was unisexual, the spikes containing male and female flowers in the pairs." But certainly *C. Scipionum* is a dioecious plant, as I have seen specimens of it with male flowers only (Plate 155); apparently however the female plant has the neuter flowers more conspicuous and more developed than usual, and perhaps may also have fertile stamens.

In the Buitenzorg Herbarium there is a portion of a specimen collected by Korthals in Borneo and labelled in the hand-writing of Blume "*Daemonorops fissus* Bl." This specimen, consisting of a portion of a leaf, is undoubtedly referable to *C. Scipionum.*

132*a*. CALAMUS SCUTELLARIS Becc. in Webbia di U. Martelli, iii, (1910), 234, 243 and in Bull. Mus. Hist. Nat. (1911), 160.

DESCRIPTION.—Apparently a rather robust plant. *Stem* . . . *Leaves* . . . *Female spadix* rather large and robust, and, as far as can be judged from the fragments, dense, twice branched and non-cirriferous; partial inflorescences 20–30 cm. long (or at times more?), with few (3–4) rather approxmate, short (10 cm. long more or less) rather stout branches; primary spathes . . ; secondary spathes very briefly tubular in their basal part, slashed longitudinally into several stripes, brown, exsuccous, membranous, quite unarmed, glabrescent, finely striate, about as long as their respective branches, which are inserted about half way up their length; the axis of the partial inflorescences is thickish, has short internodes, is obsoletely angular or subterete and is quite smooth; the branches are short, arched, have only 4–6 irregularly spreading, brachiate, rather approximate spikelets; the axis of the

branchlets is short (4–5 cm. long), terete, 5–6 mm. thick at its base, speedily narrowing and terminating in a spikelet; tertiary spathes thinly membranous, very briefly cyathiform, truncate and entire at the mouth, very slightly produced at one side, glabrous, finely striate, unarmed; spikelets sinuous, vermiform, terete, about 3 mm. thick in their axial part, and 7–9 cm. long, inserted just outside the mouth of their respective spathes, and carrying distichally 20–25 flowers on each side; spathels shortly infundibuliform, truncate and entire at the mouth, slightly produced at one side into short triangular points, finely veined; involucrophorum shallowly-cupular, protruding slightly beyond its spathel, subpedicellate; involucre conspicuous orbicular, entire, concave, pateriform and quite on a level with the involucrophorum, areola of the neuter flower broadly ovoid, slightly concave, sharply edged. *Female flowers* 4 mm. long. *Fruiting perianth* explanate; the calyx has a smooth callous base and is deeply parted into 3 strongly striately veined lobes; the segments of the corolla are barely longer than the calyx, acute and also striately veined. *Fruit* ovoid, shortly and acutely beaked, 12 mm. long, 8 mm. broad; scales arranged in 21 longitudinal series, subsquarrose, very thin, rather dull, slightly convex, not or only very obsoletely convex along the centre, brown with a darker intramarginal line and finely fringed ferrugineous margins, the point not produced, yet acute. *Seed* broadly ovoid, rounded at both ends, slightly excavate and with a broad rather deep central chalazal fovea on the raphal side, otherwise with a slightly uneven surface; albumen equable; embryo basal, slightly to one side.

HABITAT.—Lower Tonkin: the portions of the spadix with mature fruits were bought in the market of Thanh hoa, on the 30th October 1892, by the *Rev. Père Bon* (No. 5743 in the Paris. Herb.-arium.)

OBSERVATIONS.—Of this species I have seen only detached portions of a fruiting spadix, and from these I judge it to be a rather large plant. It belongs to group XV(A), but apparently it is not closely related to any of the known species, except perhaps *C. Scipionum.* It is distinguishable by its short branches with very few, thickish, brachiate, sinuous, many-flowered spikelets, which have a conspicuous saucer-shaped involucre; by the small fruit with subsquarrose, not grooved, ferrugineously fringed. scales; by the slightly unevenly surfaced seed with equable albumen, and embryo slightly shifted to one side, and by the laciniate secondary spathes.

SUPPL. PLATE 39.—Calamus scutellaris *Becc.* Portions of the fruiting spadix, From the type specimen in the Herbarium at Paris, Père Bon No. 5743.

133. CALAMUS DENSIFLORUS Becc. Add :—Ridley, Mat. Fl. Mal. Penins. ii, 196.

Add to the localities the following given by Ridley: Selangor: Kwala Lumpur (*Ridley*); Kemaman (*Vaughan Stevens*); Batang Berjuntai (*Ridley*). Native name, "Rotang Chichi."

133*a*. CALAMUS PALEMBANICUS Becc. n. sp.

DESCRIPTION.—Scandent, rather slender. *Sheathed stem* 15–20 mm. in diameter. *Leaf-sheaths* slightly larger in their upper than in their basal part, very obliquely truncate

at the mouth which is edged by a narrow, dry, membranous, glabrous rim: they are thick and woody, glabrous and of a greenish straw colour, powerfully armed with very unequal scattered spines, of which some are large and very strong with a very broad swollen base concave below and a woody, straight, slightly-deflexed, brownish point, 10–15 mm. long: others are smaller but of the same shape, while the smallest are reduced to small bulbous horizontal prickles; ligule very short, triangular, woody, glabrous. *Leaves* apparently cirriferous (the one seen is incomplete), 1·50 m. long or thereabouts in the pinniferous part; petiole very short, the lowest leaflets being attached only 5–8 cm. above the mouth of the sheath; it is—like the first portion of the rachis—8 mm. broad, flat above, convex underneath with the edges acute and occasionally armed with a robust spine; higher up the rachis, which is glabrous throughout, has a smooth salient angle (at first obtuse, then acute) and flat side-faces above, and is armed underneath with a line of single black claws along the centre, and a few scattered prickles at the sides; the claws become ternate towards the upper end which apparently terminates in a clawed cirrus, but this part is wanting in the specimen seen by me. *Leaflets* not very numerous, more or less distinctly geminate on each side of the rachis, with vacant spaces 10–20 cm. long interposed between the pairs; those of each pair also rather distant from each other (from 1·5 to 3 cm. apart): they are narrowly lanceolate, gradually tapering from the middle downwards to an acute base and upwards to an acuminate and at the sides minutely-bristly spinulous apex: they are thinly papyraceous, almost glossy on the upper surface, slightly paler and dull underneath, quite smooth and glabrous on both surfaces, distinctly 3-costulate, and, at times, sub-5-costulate; the costae are slender but sharp, and of equal strength with a few fine secondary nerves between them; transverse veinlets numerous, very fine and much interrupted; margins appressedly, minutely and remotely spinulous; the intermediate leaflets are 30–35 cm. long, 25–27 mm. broad; the upper leaflets are shorter and narrower: those near the base are very narrow (7–12 mm. broad), slightly shorter than the mesial and more spreading. *Male spadix* . . . Of the *female spadix* I have seen only two, perhaps not entire, branchlets bearing the spikelets (partial inflorescences); the branchlets are rigid, short, thickish, and have the spathes infundibuliform, obliquely truncate, and loosely sheathing at the mouth, which is prolonged at one side into a short triangular ciliate point; they narrow considerably in their lower part, where they are flat with acute edges on the axial side and are slightly armed with a few scattered, very minute prickles; the lowest spathe is about 3 cm. long, 7–8 mm. broad at the mouth; spikelets short and thick, inserted above the mouth of their respective spathes, spreading and slightly arched; the lowest spikelet is 5–7 cm. long and bears 10–14 flowers on each side: the others are gradually slightly shorter; spathels closely packed, subscurfily-puberulous, very shortly asymmetrically infundibuliform, ciliate, produced at one side into a concave, broadly-triangular point subtending the fruits; involucrophorum shallowly cupular, bidentate, and two-keeled on the side next to the axis; involucre hardly distinguishable from the involucrophorum and immersed in it, irregularly cupular, excavate and bidentate on the side of the neuter flower, of which the areola is distinctly lunate and sharply edged. *Fruiting perianth* explanate; the calyx split down almost to the base into 3 ovate acute lobes; the corolla as long as the calyx, its divisions smaller than the lobes of the calyx. *Fruit* apparently ovoid-elliptical (not one seen entire), probably about 12 mm. long and 8–9 mm. thick; scales

rhomboidal with blunt apices, of a light straw colour and with narrow whitish edges, slightly convex and very slightly or obsoletely grooved along the centre, the margins very finely ciliate-erose. *Seed* somewhat longer than broad, flattened, equally rounded at both ends, 7·5 mm. long, 6·5 mm. broad, 4 mm. thick, slightly convex and uneven on the antiraphal side, flattish and with a central circular chalazal fovea from which radiate several shallow furrows on the raphal side; albumen homogeneous; embryo basal.

HABITAT.—Sumatra: Palembang on the River Biroo; collected by *Buurman van Vreeden*, 25th Feb. 1892. Specimen in the Buitenzorg Museum variorum No. 119. Vernacular name "Rotang Sego aer." Probably its Rotang is a valuable one, as the name of "Rotang Sega" or "Sego" is given by the Malays to the best commercial kinds.

OBSERVATIONS.—The affinities of *C. palembanicus* are not very apparent; it seems to approach *C. densiflorus* especially in the structure of the spadix. It is distinguishable by its woody leaf-sheaths, not exactly cylindrical, but with a somewhat larger diameter above than at the base, armed with robust broad-based underneath concave spines; by the leaves with few, 3-costulate, lanceolate, acuminate leaflets, which are more or less distinctly geminate on each side of the rachis, and have very long vacant spaces interposed between the pairs; by the spadices with thickish rigid branches, and infundibuliform loosely sheathing slightly prickly spathels; by the short and thick spikelets with approximate spathels and very closely packed fruits; by the fruits being ovoid with light-coloured, obtuse, not or obsoletely grooved scales; and by the oblong flattened seed with a central rather deep chalazal fovea, and by the homogeneous albumen and basal embryo.

SUPPL. PLATE 40.—Calamus palembanicus *Becc.* Portion of a sheathed stem; basal part and intermediate portions of a leaf; branchlets of the fruiting spadix. From the type specimen, in the Buitenzorg Herbarium.

134. CALAMUS RIDLEYANUS Becc. add:—Ridley, Mat. Fl. Mal. Penins. ii, 197.

Add to the localities the following given by Ridley: Mandai; Johor, Gunong Pulai.

137. CALAMUS POLYSTACHYS Becc.

OBSERVATIONS.—I have described this species from specimens gathered from a plant of uncertain origin, cultivated in the Buitenzorg Botanical Garden. Now I have found in the Buitenzorg Herbarium portions of female spadices with unopened flowers, numbered No. 3594, collected by Teijsmann at Muara dua in Sumatra, Province of Palembang which correspond exactly with the cultivated specimens described by me. There is therefore little or no doubt that the cultivated specimens are derived from seed brought by Teijsmann from the above mentioned locality in Sumatra. Teijsmann's specimen is labelled *Calamus rhomboideus* Bl. and bears the vernacular name "Hui-ulet". There remains however some doubt whether this label was not that of quite another plant collected in the same locality, as *C. polystachys* is a species

so widely different from *C. rhomboideus*, that Teijsmann could not have given it even provisionally such a name.

139 CALAMUS ZOLLINGERII Becc.

Add to the localities: Celebes, Province of Minahassa (Menado), *Koorder's* No. 18401β (sterile) in the Buitenzorg Herbarium.

140. CALAMUS MERRILLII Becc. Add:—Becc. in Webbia di. U. Mart. i, (1905), 347, and in Philipp. Journ. Sc. iv, (1909), 629.

DESCRIPTION.—I am able to complete the description of this large *Calamus* from a fine specimen preserved in the Herbarium at Kew, bearing an entire spadix in fruit, collected by Loher at Montalban, Province of Rizal, Luzon, No. 7076. A male spadix of the same species has been collected also by Loher on Mount Matulid, 1,200 m. elev. No. 7074 in the Kew Herbarium.

Sheathed stem in Loher's No. 7076 is 6–7 cm. in diameter. The *fruiting spadix* is robust, nodding, 1·3 m. long, including a terminal, tail-like, flattened subulate appendage, which is formed of several tightly sheathing, smooth or slightly prickly spathes; it is divided into 8 gradually diminishing, spreading and arched partial inflorescences, of which the largest (which are also the lowest) are 35–40 cm. in length. The lowest spathe is strongly flattened, 3–3·5 cm. broad, two-edged, the edges sharp, and without spines, 16–17 cm. long, very tightly sheathing, slightly obliquely truncate at the mouth, and very sparingly armed with a few straight small spines; the other primary spathes are tubular, more or less longitudinally split, obliquely truncate at the mouth, prolonged at one side into an acuminate, dorsally-keeled point, and bearing irregularly spread, small, broad-based, and subbulbous horizontal prickles. The largest partial inflorescences carry 10–13 spikelets on each side, and terminate in a small, smooth, tail-like appendage; the secondary spathes are truncate at the mouth, and prolonged at one side into a broad triangular point; they are either quite smooth or have at most one or two rudimentary or tuberculiform prickles. The spikelets are 8–9 cm. in length, slightly flattened, 8 mm broad between the spathels (not taking into account the flowers). *Fruit* spherical or nearly so when quite mature, surmounted by a rather thick and blunt beak about 12 mm. in diameter. *Seed* somewhat flattened, orbicular, 8·5–9 mm. in diameter, 6 mm. thick, flattish on the raphal side, convex on the other, exactly as already described and figured at page 392 and in plate 167.

SUPPL. PLATE 41.—Calamus Merrillii *Becc.* Portion of the sheathed stem with the base of a spadix; portion of a leaf not very far from its base (upper surface); portion of the fruiting spadix. From Loher's No. 7076 in the Herbarium at Kew.

CALAMUS MERRILLII var. MERRITTIANUS Becc.

C. Merrittianus Becc. in Philipp. Journ. Sc. ii, (1907), 233, and iv, (1909), 629.

I now consider as belonging to a simple variety of *C. Merrillii*, and even to one not well defined, the specimens of a *Calamus* collected in Mindoro by *Mr. M. P. Merritt* on the Bongobong River (No. 3912 Herb. Manila) upon which I had based

the new species *C. Merrittianus*, which was distinguished on account of its primary and secondary spathes being densely prickly, while those of the typical *C. Merrillii* of Luzon have these spathes quite smooth.

Later I have also (Philipp. Journ. Sc. ii, 233) considered as belonging to *C. Merrittianus* the specimens of a *Calamus* collected in Mindanao by Mrs. Mary Strong Clemens (Nos. 1112 and 1124, Herb. Manila), which had primary and secondary spathes also prickly, but in a lesser degree than in the plant from Mindoro, presenting therefore a transitional form between *C. Merrittianus* and *C. Merrillii*, and I expressed on that occasion the opinion that perhaps *C. Merrittianus* was only a variety of *C. Merrillii*. Now I am strengthened in this opinion by the additional material collected in Mindanao by Mr. Elmer (Nos. 11874 and 11885). Number 11874, collected at Todaya on Mount Apo, has a sheathed stem 8–9 cm. in diameter, and bears an entire male spadix, which has the primary and secondary spathes at times densely, and all others slightly prickly. Number 11885, also from Todaya, bears a spadix with mature fruits, which agree exactly with those of the typical *C. Merrillii* from Luzon, and has some of the secondary spathes smooth, while others are more or less prickly. This *Calamus* is named by the natives in Mindanao "Acab-bacab." In conclusion the typical *C. Merrillii* is the Luzon plant with smooth secondary spathes. The variety *Merrittianus* with densely prickly secondary spathes is particularly the plant of Mindoro, while the plant of Mindanao is intermediate between the two.

SUPPL. PLATE 42.—Calamus Merrillii VAR. Merrittianus *Becc.* Upper portion of a leaf-sheath with the base of the petiole; intermediate portion of a leaf; partial inflorescence with growing ovaries. From Merritt's No. 3912 in Herb. Beccari.

CALAMUS MERRILLII var. NANGA Becc. n. var.

DESCRIPTION.—A smaller plant than the type. *Sheathed stem* 5 cm. in diameter. *Leaf-sheaths* less densely armed than in the type, but with the same kind of spinescence. One leaf is 4·5 m. long in the pinniferous part, the upper end of the rachis gradually passing into a very robust and long cirrus, armed with half to three-quarter whorls of extraordinarly robust black claws; the petiolar part is about 50 cm. long, very robust, 3·5 cm. broad, concave above, convex below, prickly on the edges; leaflets exactly as in the type. A fruiting spadix is 1·40 m. long; its primary spathes are minutely prickly, the secondary spathes are smooth or nearly so; spikelets more slender than in type. *Fruit* spherical, also smaller than in type, 9 mm. in diameter, otherwise the same.

HABITAT.—Collected by *Elmer* in the Island of Mindanao at Todaya on Mount Apo in wooded gulches, and along the Sibulan River gorge at 300—600 m. No. 11110 in Herb. Beccari. Vernacular name "Nanga."

OBSERVATIONS.—Except in the smaller size of the plant, in the more slender spikelets and in the smaller fruits, I have discovered no differences in it from the typical *C. Merrillii*.

141. CALAMUS AQUATILIS Ridl. Add: Ridl. Mat Fl. Mal. Penins. ii, 210.—*Daemonorops erinaceus* Becc. in Rec. Bot Surv. Ind. ii, (1902), 225.

DESCRIPTION.—I have now recognized in *C. aquatilis* Ridley the *Daemonorops erinaceus* which I described from a sterile specimen collected by me in Borneo, at Sibo, near the seashore, not far from the mouth of the Sarawak River (Pl. Born. No. 2192). To the same species is referable a specimen with an entire fruiting spadix collected by *Low*, also in Borneo, preserved in the Botanical Museum at Kew and bearing the Malay name "Rotan Tengang." With the help of these specimens I am now able to complete the description already given at page 593.

Sheathed stem 2·5–4 cm. in diameter. *Leaf-sheaths* strongly gibbous above, very obliquely truncate at the mouth, which, like the gibbosity and the base of the petiole, is densely clothed with blackish, 10–15 mm. long, criniform spiculae; also near the mouth rise erect a few long (5–8 cm.) needle-like, thickish, although somewhat flattened spines; the entire surface of the sheaths is very densely armed with many, rather approximate, interrupted, oblique series of unequal spines, which vary from 1–6 cm. in length and are blackish or of a chocolate-brown colour, narrow, needle-like, flattened, thickish, rigid, horizontal or slightly deflexed, confluent by their bases into a very narrow, slightly raised crest; with these spines are mixed many slender and criniform spiculae; a greyish, apparently waxy, thin, powdery coating covers the entire surface of the sheaths and the bases of the spines. *Leaves* of full grown plants 2·75 m. long in the pinniferous part, and terminating in a rather strong cirrus, 1·4 m. long; petiole 25–30 cm. long, 2–2·5 cm. broad at its base, sprinkled, like the rachis, with a powdery fugacious scurf, smooth, very slightly concave or flattish on the upper surface, rounded underneath where armed only on the margins, especially in its basal part, with long and very narrow, needle-like, thickish, very rigid, brown, horizontal or slightly deflexed spines, with which are intermingled other smaller spines pointing contrary ways; the rachis on the upper surface is sparsely prickly throughout; at first it is flat, then slightly channelled, and towards the end has a salient and strongly prickly angle; at the sides it is deeply grooved where the leaflets are attached; underneath it is strongly convex, at first smooth along the centre, thence remotely armed first with solitary, higher up with ternate, and on the cirrus with half-whorled claws. *Leaflets* exactly as already described. *Female spadix* simply decompound, apparently shorter than the leaves, rather robust, as thick as a man's little finger in the lower part of its main-axis; it has several arched and recurved partial inflorescences, of which the lowest are about 50 cm. long; the lowest spathe protrudes very slightly from the axilla of the leaf; the other primary spathes are tubular, not very elongate, 7–8 cm. long in the exposed part, slightly enlarged above or very narrowly infundibuliform, closely sheathing, almost horizontally truncate at the mouth, produced at one side into a triangular acute point, armed with numerous, small, short, but robust, scattered or slightly confluent, reversed prickles. The remainder as already described.

SUPPL. PLATE 43.—Calamus aquatilis *Ridley*. Portion of the sheathed stem and terminal part of a leaf. The specimen described under the name of *Daemonorops erinaceus* in Records Bot. Surv. Ind. l.c.—No. 2192 Becc. Pl. Born.

SUPPL. PLATE 44.—Calamus aquatilis *Ridley*. Portion of the sheathed stem bearing the lower part of a spadix with immature fruits. From Low's specimen in the Museum at Kew.

142*a*. CALAMUS FOXWORTHYI Becc. n. sp.

DESCRIPTION.—Scandent and rather robust, about 7 m. long (Robinson). *Sheathed stem* about 4 cm. in diameter or at times more. *Leaf-sheaths* coriaceous, very densely covered with innumerable, blackish, glossy, rigid, subpungent, criniform, 15–20 mm. long bristles, which are arranged in almost continuous series, and have their bases immersed in a rusty, cottony indumentum. *Leaves* rather large (about 2 m. long—Foxworthy); the cirrus elongate, armed at almost regular intervals of 2–3 cm. with $\frac{3}{4}$-whorls of robust, black-tipped claws; petiole short and robust, about 20 cm. long and 2 cm. broad (in one specimen), flattish, quite smooth and glabrous on the upper surface, with prickly margins, softly furfuraceous and densely armed underneath with unequal, slender, straight, irregularly seriate spines; rachis in its first portion furfuraceous and also spinous on the back, prickly and with a narrow channel at the sides where the leaflets are inserted; in its upper portion the rachis is almost rectangular in cross section, has a salient, acute, smooth angle above, and is armed underneath with half-whorls of very robust, highly connate, black-tipped claws; leaflets very numerous, very regularly set, 20–25 cm. long, 10–12 mm. broad, the lower very approximate and more spreading than the upper; the latter 20–25 mm. apart; all are linear-lanceolate, slightly narrowing towards the base, very gradually acuminate to a subulate bristly tip, papyraceous, green and concolorous on both surfaces, with 3 sharp, slender costae, which carry rather long bristles on both surfaces; the bristles are light coloured with a blackish base; margins remotely, irregularly and sparingly bristly. *Male spadix* . . . . *Female spadix* apparently shorter than the leaves (not seen entire by me); it has a rigid, straight, flattened main axis, and numerous distichous, approximate, partial inflorescences; the peduncular part is very short, flattened, furfuraceous and covered with black spiculae; primary spathes short, the lower 6–7 cm. long, 18–20 mm. broad, strongly flattened, tubular, closely sheathing, slightly infundibular, sprinkled with black acicular spines, papyraceous, dry and discoloured in their upper part which remains sharply distinct from the lower and living: they are entire, glabrous and obliquely truncate at the mouth, prolonged at one side into a triangular acuminate point; partial inflorescences 25–30 cm. long, arising erect from their respective spathes and inserted inside of them by a distinct pedicellar part and bearing distichally 6–7 spikelets; secondary spathes tubular-infundibuliform, membranous, dry and marcescent, prickly on their basal part, prolonged at one side into a triangular, usually split and lacerated point; spikelets slightly flattened, erect, slightly arched, inserted inside their respective spathes by a flattened pedicellar part, rather brittle: the lowest and largest are 6–8 cm. long, and have 12–14 flowers on each side: the upper are somewhat shorter and have fewer flowers; spathels broadly asymmetrically infundibuliform, striately veined, densely furfuraceous in their basal part, truncate at the mouth, split longitudinally or lacerated on the outer side; involucrophorum inserted at the bottom of its own spathel, dimidiately infundibuliform, rather deep, somewhat narrowed to the base or subpedicellate, bidentate and acutely 2-keeled on the side next to the axis; involucre deep, cupular, entire, asymmetrically evolute on the side of the neuter flower; areola of the neuter flower distinct, concave, sharply edged; sometimes two female flowers and a neuter one spring from the same spathel. *Female flowers* oblong, 4 mm. long, 1·5 mm. broad; the calyx tubular-campanulate, superficially 3-dentate,

with a brush of furfuraceous hairs on the apex of each tooth, obscurely striately veined; the corolla not quite twice as long as the calyx, its segments lanceolate, acuminate, almost polished outside. *Fruiting perianth* quite explanate, the calyx split into 3 parts down to the base. *Fruit* small, spherical, distinctly beaked, 7 mm. in diameter, the pericarp thin and brittle; scales in 21 series, very small, narrowly and superficially grooved along the centre, straw-yellowish with a narrow reddish-brown marginal line, the apex rather obtuse and the margin scariose and finely denticulate. *Seed* subglobular, very irregular and more or less flattened; albumen equable.

HABITAT.—Philippines: Discovered in March-April 1906 by *Dr. F. W. Foxworthy* on Victoria Peak at 1050 m. above the sea in the Island of Palawan; No. 690 in the Manila Herbarium.

OBSERVATIONS.—Curiously enough this species is closely related to *C. Warburgii* K. Schum. of the coasts of German New Guinea. It approaches also *C. polystachys* in the spinescence of the leaf-sheaths and the general structure of the leaves and spadix, but in *C. Foxworthyi* the spikelets are always solitary at each spathel. *C. Foxworthyi* differs from *C. Warburgii* in the longer petiole; in the shorter partial inflorescences; in the secondary spathes, not entire, but lacerated, and prickly in their basal part; in the spathels being also split and lacerated on the outer side, and in the fruit being spherical not ovoid.

SUPPL. PLATE 45.—Calamus Foxworthyi *Becc.* One side of the basal portion of a leaf; intermediate portion of a leaf; portion of the terminal cirrus; upper end of a leaf-sheath bearing the base of a female spadix; detached female partial inflorescence; fruits and seeds. The type specimen in Herb. Beccari (Foxworthy, No. 690 Herb. Manila.)

143. CALAMUS MOSELEYANUS Becc. Add:—Becc. in Webbia di U. Martelli, i, 348.

OBSERVATIONS.—To this species apparently belongs a specimen with male flower collected by *Hallier* in February 1904 (Herbarium of Manila) at San Ramon, distric of Zamboanga in Mindanao, and perhaps also *Elmer's* specimens numbered 11886, collected also in Mindanao at Todaya on Mr. Apo. These specimens bear only male spadices, and it is difficult to distinguish the allied species of the group of *C. palustris* from these alone.

143*a*. CALAMUS MINDORENSIS Becc. in Philipp. Journ. Sc. ii, Botany (1907), 235 and iv, (1909), 625.

DESCRIPTION.—Rather robust and high scandent. *Sheathed stem* 4–5 cm. in diameter. *Leaf-sheaths* woody, 3 mm. thick, greenish, with a smooth surface, very thinly covered when young with a fugacious ashy indumentum, strongly gibbous above, feebly armed with very small, scattered, 3–4 mm. long, horizontal, semi-conical straight spines, which have the tip slightly darker than the surface of the sheath, and the base lighter and tumescent. *Ocrea* very short, axillary, liguliform. *Leaves* large, about 2 m. long in the pinniferous part; the cirrus very robust and strongly clawed; petiole very short and robust or almost obsolete, flattish and smooth on the upper surface, 3 cm. broad, armed along the margins with rather stout 8–10 mm.

long, straight, horizontal spines; rachis in the intermediate portion obtusely trigonous, fugaciously ashy-furfuraceous, with an obtuse, smooth salient angle on the upper surface, armed underneath at the base with rather remote, solitary, but higher up with at first binate, then 3-nate, black-tipped claws. *Leaflets* rather numerous, about 50 in all, equidistant, not very approximate (6–7 cm. apart), rather rigidly papyraceous, green on both surfaces, slightly paler underneath, narrowly elliptical-lanceolate, tapering almost equally towards a plicate-pluricostulate base and an acute apex, the latter spinulous; the mid-costa alone rather prominent and sharp on the upper surface and spinulous, as are two other side costulae which are near the upper margin; the other costulae very slender and smooth; underneath the nerves are numerous but devoid of bristles or spinules; the intermediate leaflets are 45–47 cm. long, and 4·5–5 cm. broad: the lower ones are smaller, 20–25 cm. long and proportionally narrower. *Male spadix* forming a large compound and diffuse panicle, 2 m. in length, glabrous in every part and divided into several triple-branched, partial inflorescences; primary spathes thinly coriaceous, greenish-yellow, tubular, tightly sheathing and smooth; the first spathe is 15 cm. long, and about 3 cm. broad, flattened, two-edged, the edges very sharp and spinous above, horizontally truncate and fringed with paleaceous scales at the mouth, prolonged at one side into an elongate, triangular, dorsally keeled and spinous point. The partial inflorescences are flexuous, very long and slender; one belonging to the lower part of the panicle is 1·2 m. in length, with its axial part 5–6 mm. thick at the base and with about 12 branches distichally inserted on each side; secondary spathes tubular, tightly sheathing, 3–4 cm. long, smooth, entire, truncate and also ciliate at the mouth, and prolonged at one side into a triangular acute point; the secondary branches are inserted outside the mouth of their respective spathes, and have a distinct axillary callus; they are slender, flexuous, 2–2·5 mm. thick, 30 cm. long, or thereabouts, and bear distichally numerous spikelets; the tertiary spathes are smooth, elongate, infundibuliform, 10–15 mm. long, truncate and ciliate at the mouth like the others and prolonged at one side into a triangular point which subtends their respective spikelets. The spikelets are pectinate and spreading, arched, usually 2 cm. long or at times shorter, bearing about 20 very approximate, exactly bifarious flowers on each side, and when measured with the flowers about 6 mm. broad; spathels very short, very closely packed, concave and almost boat-shaped, obtuse and deflexed; involucre formed by two concave bracteoles united by their bases and immersed in their respective spathels which contribute with the involucre to form a small cup to their respective flowers. *Flowers* in contact with one another; the full grown bud is 2·5–3 mm. long, cylindrical apiculate; the calyx has 3 deltoid, acute, deeply-striate teeth; the corolla is twice as long as the calyx. *Female spadix* decompound, forming a large diffuse panicle; primary spathes . . . ; partial inflorescences 40–50 cm. long (the few I have seen) with 10–12 spikelets on each side; secondary spathes (the spathes of the partial inflorescenses) narrowly tubular–infundibuliform, unarmed, striolate, very thinly and fugaciously furfuraceous, produced at the summit into a broadly-triangular acute point; the mouth ciliate with small paleolae; spikelets (when bearing the fruit) spreading or horizontal, slightly arched, with a distinct axillary callus and inserted just at the mouths of their respective spathes, 10-12 cm. long (the upper ones somewhat shorter) with 20–22 distichous flowers on each side; spathels shortly, very broadly

and asymmetrically infundibuliform, obsoletely striately veined, slightly produced and apiculate on the lower side, truncate and deciduously ciliolate at the mouth; involucrophorum very shallowly cupular, immersed within its own spathel, bidentate, and laterally adnate to the base of the spathel above its own; involucre shallowly and irregularly cupular; areola of the neuter flower very depressedly lunate. *Fruiting perianth* shortly but distinctly pedicelliform; the calyx parted down almost to the middle into 3 triangular, slightly striately veined, acute lobes, and with a callous smooth base; the segments of the corolla triangular, barely shorter than the teeth of the calyx. *Fruit* small, spherical, abruptly and comparatively stoutly beaked, 6·5 mm. in diameter (when not quite ripe), with a small basal acute caudiculum, which penetrates within the perianth; scales in 18–20 longitudinal series, glossy, convex and not grooved along the centre, of a dirty straw-yellowish colour with a reddish slightly-produced tip and a scarious erosely-toothed margin. *Seed* small, globose (not quite mature).

HABITAT.—The Philippines: Balete on the Rio Baco in Mindoro, collected in April 1905 by *R. C. McGregor* (No. 309, fruiting specimen in Herb. Manila). The male plant has been collected in June 1907 by *M. L. Merritt* also in Mindoro. It is a commercial Bejuco (Rotang); native name "Tumalin" (No. 6217 in the Herbarium at Manila).

OBSERVATIONS.—A very near ally of *C. Moseleyanus*, from which it differs in its larger dimensions, in the larger and more diffuse spadix with much longer spikelets, and especially in the smaller fruit with more numerous and more appressed scales, which are arranged in 18–20 longitudinal series, while they are in 12 series only in *C. Moseleyanus*.

SUPPL. PLATE 46.—Calamus mindorensis *Becc.* Leaf-sheath with the lower part of a leaf; intermediate portion of a leaf; portion of the leaf cirrus; partial inflorescence of the fruit spadix. From MacGregor's No. 309 in Herb. Beccari.

143*b*. CALAMUS VIRIDISSIMUS Becc. n. sp.

DESCRIPTION.—Scandent and rather slender. *Sheathed stem* 25 mm. in diameter. *Leaf-sheaths* gibbous above, very obliquely truncate and smooth at the mouth, greenish-brown when dry, dull and slightly rough to the touch, being very minutely scabrid on the exposed part, armed with scattered, very small (5–6 mm. long at most) horizontal spines, which have a semi-conical base and a very sharp point; ligule very short, glabrous. *Leaves* about 1·6 m. long in the pinniferous part; petiole quite obsolete, the leaflets extending clear quite to the base; rachis 12–13 mm. broad at its base, where it is flattish above and convex underneath; a little above the base it is more convex on the upper than on the lower surface, is not grooved along the sides, where the leaflets are inserted, and is furnished above near the edges at about its third lower part with a line of small prickles similar to those on the leaf-sheaths, otherwise the upper surface is smooth and is very obsoletely bifaced with a very obtuse salient angle near the upper

edge only; on the under surface it is smooth a long way up, but shortly below the cirrus it is armed with ternate claws; the cirrus is rather slender, about 1 m. long, with a few reduced and scattered leaflets along its lower portion, otherwise powerfully armed at almost regular distances of 15–20 mm. with half-whorls of not very robust but very sharp claws. *Leaflets* not very numerous, about 50 on the whole, very inequidistant, usually very conspicuously approximate in pairs on each side of the rachis, occasionally with solitary ones between the pairs (vacant spaces between the pairs 6–10 cm. long): the two of each pair very approximate (1–3 cm. apart); leaflets lanceolate-elliptical, tapering equally from their middle downwards to an acute base and upwards to a gradually very acuminate quite glabrous and smooth tip, they are thinly papyraceous, deep green, and almost equally shiny on both surfaces, quite devoid of hairs or spinules in every part, including the margins and the apex, and only at times furnished with a solitary, erect and relatively robust spinule on the mid-costa near the base: they are faintly 5 costulate, all the costulae being very slender: the central is slightly stronger than the side ones, which are scarcely more prominent than a few secondary nerves interposed between them; transverse veinlets slender but very distinct, pellucid, rather numerous, very sinuous; the intermediate leaflets are 18–25 cm. long, 3–4 cm. broad, those of both ends much reduced. *Male spadix* rises erect some centimetres below the mouth of the leaf-sheaths, is ultra-decompound with several partial inflorescences; it forms a very lax, diffuse and recurved partial inflorescence 1–1·50 m. long on the whole. The lowest primary spathe is about 15 cm. long: it sheaths the entire peduncular part of the spadix, and carries just at its mouth a partial inflorescence like the upper spathes: it is strongly flattened, acutely two-edged, 15 mm. broad in its upper part, slightly narrowing towards the base, obliquely truncate at the mouth and produced at one side into a rather elongate point: it is prickly only at the end of its dorsal keel; upper primary spathes closely sheathing, more cylindraceous and shorter than the lower, also prolonged into an elongate acuminate point which is acutely keeled on its back and provided with a few spinules, otherwise the entire surface of all the spathes is smooth; partial inflorescences inserted just at the mouths of their respective spathes; the lowest about 60 cm. long with 3–4 spreading branches on each side in its lower part and several simple spikelets from the middle upwards; upper primary inflorescences reduced in length and number of secondary branches; secondary spathes tubular, slightly enlarged above, closely sheathing, smooth, very obliquely truncate and ciliate at the mouth, produced at one side into a broadly triangular acute point; they are usually shorter than the space interposed between two branches, or in other words the branches (and the spikelets also) are inserted somewhat above the mouth of their respective spathes; lower branches 15–18 cm. long with about 12 spikelets, very regularly and distichally set on each side; the lower spikelets of the branches are about 3 cm. long, somewhat arched, when loaded with flowers flattened and pectinate, about 7 mm. broad, and with 15–18 very approximate or contiguous flowers on each side, and spathels extremely approximate, concave, bracteiform, horizontal or somewhat deflexed, but subtending the base of their respective flowers with their acute ascendent points; involucre sub-dimidiately cupular, more or less distinctly bidentate on the posticous side; both spathes and involucre are minutely ciliate on the edges; the spikelets of the terminal part of the partial

inflorescences are longer than those of the branches, 4–7 cm. long with 20–23 flowers on each side. *Male flowers* oblong, obtuse, 3 mm. long. *Female spadix* . . . .

HABITAT.—The Philippines: Island of Mindanao at Todaya (Mount Apo), district of Davao, in wooded ravines at about 300 m.; collected in October 1909 by Mr. *Elmer* (No. 11938).

OBSERVATIONS.—It approaches *C. palustris* and the allied species *C. Moseleyanus* and *C. mindorensis* in the male spadix, the female spadix being unknown. It is easily distinguishable by its distinctly geminate leaflets, which keep a deep green colour even in the dried specimens, and are quite bare of hairs and spinules (at least in the leaves of the adult plant) except occasionally a spinule at the base of the mid-costa on the upper surface.

SUPPL. PLATE 47.—Calamus viridissimus *Becc.*—Portion of a sheathed stem bearing the base of a male spadix; intermediate portion of a leaf. From Elmer's No. 11938 in Herb. Beccari.

146. CALAMUS PALUSTRIS Griff. Add:—Ridley, Mat. Fl. Malay Penins. ii, 206.

OBSERVATIONS.—I have not seen the specimens from Negri Sembilan, which Ridley names *C. palustris*, and do not know if they belong to the "forma typica" or to the var. *malaccensis*, as Scortechini's No. 506, also quoted by Ridley, certainly does.

CALAMUS PALUSTRIS Griff. var. MALACCENSIS Becc.
C. dumetorum Ridley, Mat. Fl. Mat. Penins ii, 211.

Mr. Ridley has kindly forwarded to me the type of his *C. dumetorum* No. 11988, collected at Lahat near Ipo in Perak, which is undoubtedly referable to the variety *malaccensis* of *C. palustris*. The specimen is represented by portions of leaves and by portions of male spadices with very young flowers. The leaflets are in pairs on each side of the rachis, occasionally with solitary ones interposed between the pairs; they are elliptical-lanceolate, exactly as in the type of the variety (Scortechini's specimens); one spadix, wanting only its base, is about 90 cm. long; the leaf-sheath is armed with very unequal laminar spines, some being as much as 35 mm. in length, others only 3–5 mm. The primary spathes are armed with only a very few prickles; secondary spathes quite smooth.

146a. CALAMUS REYESIANUS Becc. in Philipp. Journ. Sc. ii, Botany (1907), 237.

DESCRIPTION.—Scandent and of moderate size. *Sheathed stem* 3 cm. in diameter. *Leaf-sheaths* thickish, woody, gibbous above, densely armed with solitary, scattered, straight, horizontal, narrowly laminar spines, which are 8–10 mm. long, and leave a very distinct impression of their outline above them on the surface of the

sheaths; near the mouth of the sheaths the spines are more crowded and somewhat longer; ocrea obsolete. *Leaves* of the adult plant large; an intermediate portion of one has the rachis almost bi-convex, smooth below, and armed above with small scattered erect prickles; leaflets inequidistant, approximate in pairs on each side of the rachis, narrowly elliptic or elliptic-lanceolate, 22·25 cm. long, 6–6·5 cm. broad, firmly papyraceous, concavo-convex, acute at the base, rather suddenly contracted above into a shortly acuminate and at the sides bristly-spinulous apex, almost glossy on the upper surface, slightly paler underneath; they have 5 slender costae and several secondary nerves often not very distinct from the costae; all the nerves are smooth on both surfaces except on the mid-costa above near the base where 1–2 small rigid spines are usually present; transverse veinlets very fine, approximate and subparallel; margins minutely spinulous. *Male spadix* . . . . *Female spadix* non-cirriferous, rather short, diffusedly paniculate, terminating in a small tail-like flattened, spinulous appendage; primary spathes very closely sheathing, thinly coriaceous, elongate-infundibuliform, densely armed on their upper part with small, straight, horizontal spines, flat on the axial side, obliquely-truncate and entire at the mouth, where they are produced at one side into an elongate triangular point, which is keeled posteriorly. Partial inflorescences divaricate, 18–30 cm. long, with 5–6 spikelets on each side; secondary spathes narrowly infundibular, armed with a few, small, horizontal, straight spines on their back at the summit, obliquely truncate, entire and fringed with decidulous paleolae at their mouths, and produced at one side into a triangular acute point; spikelets erecto-patent, inserted just above the mouth of their respective spathes, the largest 8–10 cm. in length, with 12–16 distichously arranged flowers on each side; spathels shallowly and obliquely infundibular, shortly apiculate at one side, the point usually provided below with a small spine; the margin of the spathels is entire and fringed with deciduous paleolae; involucrophorum concave, very shallow, immersed within its own spathel, produced externally into a triangular point, which subtends the neuter flower; involucre shallowly and asymmetrically cupular, bidentate and lunately excavate on the side of the neuter flower, of which the areola is comparatively large, lunate and sharply edged. *Fruiting perianth* not forming a pedicel, very broadly obconic or almost explanate. *Fruit* spherical, surmounted by a very short beak, 15 mm. in diameter; scales in 18 longitudinal series, of a reddish straw-yellow colour, with a narrow darker intramarginal line and scarious, finely erosely-toothed margins, rather convex, broadly and rather deeply grooved and with a triangular rather obtuse point. *Seed* globular, 10–11 mm. in diameter, with a not very closely pitted surface; the chalazal fovea indistinct and very superficial; albumen ruminate; embryo basal.

HABITAT.—The Philippines. The type specimen was collected in October 1904 by *C. Reyes* at Unisan, in the Province of Tayabas, Luzon. It has been found again by *M. Ramos* in March 1911 at Tagcauayan, also in the Province of Tayabas No. 13312 in the Manila Herbarium—a specimen with very young fruits and portion of an adult leaf.

OBSERVATIONS.—The type specimen is the terminal part of a fruiting spadix only. *C. Reyesianus* belongs to the group of *C. palustris*, but is at once distinguished by its perfectly spherical fruit. I have completed the description already given in

the "Philippine Journal of Science," l.c., on the specimens collected by Ramos (No. 13312).

SUPPL. PLATE 48.—Calamus Reyesianus *Becc.* Upper part of a fruiting spadix; fruit and seed, the latter cut longitudinally; upper end of a leaf from a young plant. From Reyes' specimen in the Manila Herbarium.

146*b*. CALAMUS MULTINERVIS Becc. n. sp.

DESCRIPTION.—Scandent, rather robust. *Sheathed stem* 4·5–5 cm. in diameter *Leaf-sheaths* strongly gibbous above, dull green and quite smooth on their surface and at the mouth; ocrea obsolete. *Leaves* large, about 2 m. long in the pinniferous part; petiole short and robust, about 3 cm. broad at its strongly flattened base, flattish above, convex underneath, armed with very small prickles near the bluntish edges only, otherwise smooth; the rachis, in its first portion, is also flattish above and convex below and equally smooth, and has narrow flattish edges, where the lowermost leaflets are inserted: higher up it is convex above or with the salient angle obtuse and never sharp, even towards the end: underneath, in the upper portion, it is armed with robust claws, at first solitary, then confluent in groups of 3–5 and 5–8; the cirrus is very robust, about 1·5 m. long and very powerfully clawed. *Leaflets* numerous, sub-equidistant, 6–10 cm. apart on each side, elongate-lanceolate, equally and gradually tapering towards an acute base and an acuminate, slightly bristly tip, firmly papyraceous, sublucid, equally green and quite glabrous on both surfaces; the mid-costa very slender and somewhat stronger than 2–3 other costulae, which are only a little more conspicuous than the secondary nerves interposed between them; transverse veinlets very numerous, sharp and continuous; margins remotely, very minutely and appressedly spinulous; the intermediate leaflets about 40–50 cm. long and 4–5 cm. broad. *Male spadix* large and diffuse, apparently ultra-decompound, with several partial inflorescences, which carry numerous secondary branches, of which the spathes are 4 cm. long, tubular, slightly infundibuliform, smooth, obliquely truncate and ciliate with fine paleolae at their mouths, and produced at one side into a triangular acute point; the spikelet-bearing branches are inserted just at the mouths of their respective spathes: those seen by me are 25–28 cm. long, and carry distichally with great regularity 14 spikelets on each side; the spathes of the branches are narrowly infundibuliform, 10–12 mm. long, sprinkled with very small adherent thin scales, and are truncate and ciliate with fine paleolae at their mouths; spikelets inserted just at the mouth of their respective spathes, arched, when loaded with flowers flattened, pectinate and about 8 mm. broad, when the flowers have fallen acutely tetragonous and about 3 mm. thick; spathels extremely approximate, concave, bracteiform, horizontal or somewhat deflexed, but subtending the bases of their respective flowers with their acute ascendent points; the involucre is dimidiately cupular or like a swallow's nest; the spathes and involucra are scaly furfuraceous externally and more or less minutely ciliate on the edges. *Male flowers* almost horizontally inserted, ovoid, acute, 3 mm. long. *Female spadix* simply decompound, inserted a few centimetres above a leaf axil, about 1·5 m. long on the whole; it forms a diffuse

panicle composed of several alternate partial inflorescences, and borne on a peduncular part about 45 cm. long, which is flexuose, somewhat flattened, and closely sheathed with 3 spathes; the lowest of these is 15 mm. broad and acutely two-edged, while the other two have the edges obtuse; all the primary spathes are obliquely-truncate at the mouths, and produced at one side into a triangular acuminate point, acutely keeled on the back, and with the keel more or less armed with small claws; the upper spathes are very similar to the lower ones, but are gradually shorter, cylindraceous above, and flat on the inner side at their bases; partial inflorescences inserted a little above the mouths of their respective spathes with a distinct axillary callus; the lower partial inflorescences are about 50 cm. long and bear distichally about ten spikelets on each side: the upper are somewhat reduced in length and number of spikelets; secondary spathes very narrowly infundibuliform, smooth, obliquely truncate and ciliate (deciduously) at the mouth, produced at one side into a triangular acute point; spikelets inserted just at the mouth of their respective spathes: the lower and largest are about 6 cm. long and have 10–12 flowers on each side, the others gradually shorter and with fewer flowers: their axis slender, but the spathes relatively broad, concave-subcupular, apiculate on one side; involucrophorum almost explanate, somewhat irregular, almost laterally adnate so the base of the spathel above its own; involucre concave-subcupular, irregular and more or less bi-dentate on the side of the areola of the neuter flower; this areola is conspicuous, very distinctly lunate, and sharply edged; spathels and involucre ciliate on the edges. *Female flowers* small, about 3 mm. long; the calyx parted down past the middle into 3 triangular acute lobes; the apices of the segments of the corolla are exactly level with the teeth of the calyx. *Fruiting perianth* not quite explanate under the fruit, but not pedicelliform. *Fruit* globose-ovoid, shortly conically beaked and 6 mm. in diameter when not quite mature: apparently however it remains always very small; scales squarrose, arranged in 15 longitudinal series, flat, not grooved along the centre, of a dirty straw-colour on the posticous part, and with black margins and apex which is somewhat produced and erosely toothed. *Seed.* . . . .

HABITAT.—The Philippines: Island of Mindanao, district of Davao. The male plant collected by *Elmer* at about 1,200 m. on Mount Burebid, Oct. 1909 (No. 11955). Native name "Balafa." The female plant, with immature fruits, has been collected also by *Elmer*, in the same district of Davao in September 1909 (No. 11791), in moist rich soil of a deeply forested flat at about 1,200 m., south of Bariring River. Native name "Ubbli."

OBSERVATIONS.—It is apparently related to *C. Reyesianus* from which it differs: in its larger size; in its smooth leaf-sheath; in the more elongate pluricostulate leaflets; in the larger spadix with smooth secondary spathes, and possibly also in the considerably smaller fruit, but the fruit is not fully developed in the specimens available.

SUPPL. PLATE. 49.—Calamus multinervis *Becc.* Portion of the sheathed stem; portion of the spadix with very young fruits; an intermediate portion of a leaf. From Elmer's No. 11791 in Herb. Beccari.

147a. CALAMUS ARUGDA Becc. in Philip. Journ. Science iv (1909) 622.

DESCRIPTION.—Scandent, of moderate or rather large size, the *stems* (naked canes?) 3 cm. in diameter (Klemme). *Leaf-sheaths* . . . *Leaves* rather large: in the small portion seen by me they have equidistant, alternate, not very closely set leaflets (6–7 cm. apart); the intermediate portion of the rachis is slightly convex beneath where it is armed with small claws along the middle; above it is bifaced with an obtuse, salient angle. *Leaflets* elliptical-lanceolate, broadest about their middle, and narrowing equally to both ends, gradually acuminate to a not conspicuously bristly tip; the base acute; they are rigid-papyraceous, green, slightly paler beneath than above, 5-costulate, the costae very sharp, smooth, or bearing a few inconspicuous spinules above, quite smooth beneath; margins very minutely and appressedly spinulous from the base; transverse veinlets very fine, very approximate, and continuous; the leaflets seen by me apparently belong to the intermediate portion of a leaf from a young plant, 45–46 cm. long, 5–6 cm. broad. *Male spadix* . . . . *Female spadix* not seen entire by me, apparently very dense; the summit of one (or of a partial inflorescence?) had several short approximate branchlets, each terminating in a short, unarmed, thick, caudiculum, 10–15 cm. long; spathes (primary or secondary?) tubular-infundibuliform, 3–5 cm. long, thinly rusty furfuraceous, thinly coriaceous, exsuccous, marcescent and more or less fibrous-lacerated at the mouth, prolonged at one side into a triangular, acuminate, and acutely dorsally keeled point, the keel covered with rigid spiculiform bristles which rest on a bulbous base; branchlets inserted inside, but near, the mouth of their respective spathes, 6–8 cm. long, with 3–4 spikelets on each side; secondary (or tertiary?) spathes infundibular, similar to the primary but smaller and not bristly; spikelets short, 3–4 cm. long, rather broad with a zigzag sinuous axis, and with only 4–5 alternate flowers, or pairs of flowers, on each side; spathels broad, concave, embracing the involucre, and produced at one side into a triangular point; involucrophorum concave, quite sessile, attached laterally to the base of the spathel above its own; involucre shallowly and often asymmetrically cupular, usually bidentate at one side. *Female flowers* ovate, 6 mm. long, usually in pairs at each spathel in the lower part of the spikelets, in this case not being accompanied by a neutral flower; near the end of the spikelets the female flowers are solitary and the involucre bears a very depressed lunate, sharply defined areola for the reception of the neuter flower. *Fruit* when still very young ventricose in the middle, narrowing at both ends, stoutly beaked and terminating in 3 small recurved stigmas. *Scales* in 15 longitudinal series, not channelled along the middle, of a straw-yellow colour in the posticous part and with a broad black marginal line, the point squarrose, slightly produced, and erosely-ciliate. *Seed* . . . . *Fruiting perianth* campanulate, narrowing to a rather acute base, the calyx split down past the middle into 3 broadly ovate lobes, the corolla barely longer than the calyx.

HABITAT.—The Philippines. At Zalloc, Cagayan Province, Luzon, in dense forests at about 50 m. above the sea, collected by *W. Klemme*, April 1907. (Herb. Forestry Bureau, Manila No. 6649.)

OBSERVATIONS.—A very singular species of the group of *C. palustris*, related only to *C. Jenningsianus*, but quite distinct especially by its geminate female flowers in the lower part of the spikelets.

SUPPL. PLATE 50.—Calamus Arugda *Becc.* Intermediate portion of a leaf; terminal part of a spadix; detached young fruits. The type specimen No. 6649 in the Herbarium at Manila.

147*b*. CALAMUS JENNINGSIANUS Becc. in Philip. Journ. Science, iv, (1909) 623.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* apparently 2·5 cm. in diameter *Leaf-sheaths* rather densely armed with small, rigid and short (4—5 mm. long) horizontal spiculae, which rest on a bulbous base. *Ocrea* shortly liguliform, glabrous. *Leaves* terminating in a robust cirrus, and about 80 cm. long in the pinniferous part; the petiole about 10 mm. broad and 12 cm. long (in one specimen), quite flat above where sprinkled with small and straight erect spines, convex and smooth beneath, its margins acute and sparingly prickly; rachis flattish beneath, where, but only towards the summit, it is armed with semiverticillate claws: the lower surface is quite smooth: upper surface of rachis prickly near the base but otherwise smooth, and with a not very acute salient angle; the cirrus is strongly armed with three-quarter-verticilled claws. *Leaflets* not very numerous, equidistant, rather remotely set (4–5 cm. apart on each side), elliptical-lanceolate, broadest about their middle, and equally narrowing to both ends, gradually acuminate to an inconspicuously bristly tip, the base acute, rigidly papyraceous, green on both surfaces, but paler beneath than above, 3–5-costulate; the costae very sharp above, smooth on both surfaces with the exception of 1–2 spinules which are occasionally to be found at the base of the mid-costa of upper surface; transverse veinlets minute, much interrupted, not very prominent; margins minutely spinulous near the apex, otherwise smooth. The intermediate leaflets are 22–25 cm. long., 30–32 mm. broad, the others somewhat smaller, but of the same form. *Male spadix* . . . *Female spadix* apparently not very elongate, terminating in a short tail-like appendage; primary spathes thinly coriaceous, those of the apical portion of the spadix (the others not seen by me) flattened, tubular in their lower part, enlarged above and open on the ventral side, terminating in a triangular, acuminate, acutely keeled point, the keel spinous; secondary spathes infundibuliform, rather loosely sheathing, unarmed, obliquely truncate and ciliolate at the mouth, produced at one side into a short deltoid point; spikelets short, 2–3 cm. long, scorpioid, rather thick, with very few (4–5 in all) alternate flowers; the spikelets of the lower part of the partial inflorescences probably longer and with a few more flowers. Spathels infundibuliform, obliquely truncate, very shortly produced into a rather broad triangular point at one side, obscurely dorsally keeled; involucrophorum obliquely attached to the base of the spathel above its own, shallowly cupular, bidentate on the posticous or axial side; involucre shallowly cupular with irregular, undulate margin; areola of the neuter flower depressedly lunate, sharply bordered. *Fruit* broadly ovoid-elliptical, about 25 mm. long, 18 mm. broad, very suddenly and conspicuously beaked; scales arranged in 12 longitudinal series, relatively thick, strongly convex, deeply grooved along the centre, of a straw-yellow colour, with a very narrow blackish marginal line, the point also blackish and very slightly produced. *Seed* globular, but not exactly

spherical, about 11 mm. in diameter, rather regularly and minutely foveolate all round, without a distinct chalazal fovea; albumen very deeply ruminated.

HABITAT.—The Philippines: Mindoro, on Mount Halcon at about 1,500 m. elevation, collected by *M. L. Merritt* in June 1906 (Herb. Forestry Bureau, Manila, No. 4400).

OBSERVATIONS.—A very peculiar species belonging to the group of *C. palustris*, but with the seed having a ruminate albumen and with the leaflets equidistant, lanceolate, 5-costulate. It seems related to *C. Arugda.* Of this plant I have seen only a leaf, the summit of a spadix, and a few fruits.

SUPPL. PLATE 51.—Calamus Jenningsianus *Becc.* The entire type specimen Merritt No. 4400 in the Herbarium of the Forestry Bureau at Manila.

147*c*. CALAMUS SAMIAN Becc. n. sp.

DESCRIPTION.—Scandent, medium sized. *Sheathed stem* 2·5–3 cm. in diameter. *Leafsheaths* slightly gibbous or plicate above, obliquely truncate at their mouths, armed rather densely, especially in their upper part, with feeble, light-coloured, almost regularly scattered, ascendent spines, which have a small bulbous base, and a slender, needle-like, 5–12 mm. long point; the margin of the mouth, and the very short ligula, are fringed with similar or somewhat longer spines. *Leaves* elongate, about 2 m. long in the pinniferous part and extended into a cirrus about 1 m. long, or, at times, longer; the petiole is about 15 cm. long and 15 mm. broad at the base, strongly flattened, biconvex, with rather sharp edges, and armed with small straight ascendent spines on the upper surface and at the edges; on the lower surface the petiole has only a few small straight spines along the central line; the rachis in its first portion is flattish or slightly convex and is rather broadly grooved at the sides where the leaflets are inserted; the upper surface of this first portion is more or less prickly and is armed with a line of small remote claws underneath; from about the middle upwards the rachis is bifaced, with the salient angle acute and smooth above, while the lower surface is very irregularly armed along the centre and at the sides with scattered or more or less confluent claws; the claws of the cirrus are at times solitary, but more frequently confluent, 2–5 in number, seldom however approximate in regular half-whorls; leaflets very numerous, sub-equidistant, 2·5–3·5 cm. apart on each side of the rachis, inserted at a rather acute angle, concolorous and rather dull on both surfaces, thinly papyraceous, very narrowly lanceolate, broadest a little below the middle, and thence long-acuminate upwards, to a minutely bristly spinulous tip, and downwards tapering to an acute base, subtricostulate or with a rather conspicuous mid-costa with one very slender costula on each side of it: in addition one or two secondary nerves on each side of the mid-costa are slightly less prominent than the side-costae; the 3 main costae are bristly spinulous from the middle upwards on the upper surface; transverse veinlets, rather sharp above, much interrupted; margins spinulous-serrulate; the undersurface is quite smooth; the intermediate leaflets are 25–27 cm. long, and 20–22 mm. broad:

those of both ends, except a few at the base of the cirrus, are not much smaller. *Male spadix* . . . *Female spadix* inserted not far below the mouth of its leaf-sheath, small, erect, about 40 cm. long, with only 5–6 alternate, simple, gradually reduced partial inflorescences; primary spathes closely sheathing, tubular, slightly enlarged, subinfundibuliform in their upper part, where they are rather densely beset with small prickles, very obliquely truncate at the mouth and produced into a long acuminate, membranous, erect point which subtends its respective partial inflorescence; the mouth of the leaf-sheaths is smooth or without spines; the lowest spathe very tightly sheathes the entire peduncular part of the spadix and is very similar to the upper ones, only somewhat larger, about 10 cm. long, and like these carries a partial inflorescence: is strongly flattened, acutely two-edged, spinous on the edges, about 1 cm. broad above and only slightly less at the base; partial inflorescences erect with a conspicuous axillary callus: the lowest is about 15 cm. long and carries 5–6 gradually reduced spikelets on each side; the other partial inflorescences are gradually smaller and have fewer spikelets; secondary spathes narrowly infundibuliform, obsoletely trigonous, scurfily hairy, truncate and naked at the mouths, produced at one side into a triangular dorsally-keeled point which subtends the base of the spikelets and is usually provided with a few relatively strong prickles on its keel; spikelets arched-subscorpioid, with the flowers in two not very regular series of somewhat assurgent flowers; spathels short, broadly infundibuliform or at times so approximate and shallow as to become sub-bracteiform, also scurfily hairy, shortly apiculate at one side or obtuse; involucrophorum laterally adnate to the base of the spathel above its own, very shallowly cupuliform; involucre orbicular, moulded on the involucrophorum, slightly concave or pateriform; the lowest spikelets are 6–7 cm. long and have 15–18 flowers on the whole, while the uppermost spikelets are only 15–20 mm. long and carry 5–6 flowers only; areola of the neuter flowers depressed, almost hidden under the edge of the involucre. *Fruiting perianth* pedicelliform, broader than high or somewhat depressed, the base of the calyx being thickened and enlarged, flat below and 4 mm. in diameter; from the remains the segments of the corolla appear broadly triangular and about as long as the calyx. *Fruit* spherical, 12–13 mm. in diameter (when quite mature), surmounted by a short but relatively large conical beak; scales arranged in 18 longitudinal series, considerably convex, glossy, narrowly and slightly grooved along the centre, of a light straw colour with a narrow blackish intra-marginal line extended to the rather obtuse appressed point; the margins very narrowly scarious and obsoletely and very minutely erosely toothed. *Seed* spherical, 9 mm. in diameter, minutely pitted; chalazal fovea punctiform; albumen rather deeply ruminated; embryo basal.

HABITAT.—The Philippines: Island of Mindanao, at Todaya, district of Davao, on a steep forested slope near a ridge at about 1,400 m. elevation on Mount Calelan (*Elmer* No. 11336 in Herb. Beccari). Vernacular name "Samian."

OBSERVATIONS.—It is related to *C. Jenningsianus* and allied species by the cirriferous leaves, the short spadices, the fruit with a pedicelliform perianth, and the ruminate seed. It is distinguishable by its narrow pluricostulate leaflets, by the very short spadix with subscorpiod spikelets and two series of subassurgent

flowers, and the moderately large exactly spherical fruit and globular minutely pitted ruminate seed.

SUPPL. PLATE 52.—Calamus Samian *Becc.* Portion of the sheathed stem with an entire female spadix from which the fruits have fallen; upper end of a leaf; partial inflorescence with not fully developed fruits. From Elmer's No. 11336 in Herb. Beccari.

147*d*. CALAMUS GRANDIFOLIUS Becc. in Philip. Journ. Sc. iv, (1909), 629.

DESCRIPTION.—Apparently large and scandent. *Sheathed stem* about 4 cm. in diameter. *Leaf-sheaths* strongly gibbous above, woody, very densely armed with very slender, scattered, elastic, very narrowly laminiform (sometimes bristle-like) blackish, shining, unequal spines, of which the largest are 25–30 mm. long. *Ocrea* shortly liguliform, axillary, fringed with long and rigid bristles. *Leaves* very large (in one specimen the pinniferous part is 1·7 m. long), terminating in a very robust, strongly clawed cirrus; petiole about 25 cm. long, 20–22 mm. broad, flat at the base above, and convex beneath, upwards flattened and biconvex, covered (especially on the upper surface) with short, ascendent spines which also cover the first portion of the rachis; on the margins the spines are not longer than elsewhere; the rachis is armed beneath (from the base upwards) with first solitary, then with 2- or 3-nate, and at the extremity with half-whorled, very robust claws; on the upper surface the rachis is convex-bifaced with a smooth salient angle. *Leaflets* numerous, alternate, equidistant, 5–7 cm. apart (on each side), rigid papyraceous, shining on both surfaces, rather broadly lanceolate, narrowing from below the middle to a rather acute base, very gradually acuminate to a bristly tip; the intermediate ones 40–42 cm. long, 4–5·5 cm. broad; the mid-costa is slender, but sharp above and has. 4–5, or more at times, slender, unequal, secondary nerves on each side of it; all nerves smooth on both surfaces; transverse veinlets very close together and very sharp; margins remotely and appressedly spinulous. *Male spadix* . . . . *Female spadix* rigid, strict, erect, short (50 cm. long in one specimen) apparently appressed to the stem, with a very short (3 cm. long), 15 mm. broad, almost unarmed, much flattened pedicellar part, which gradually passes into the first spathe; the spadix bears only 4 small, gradually decreasing, partial inflorescences, which are inserted inside the mouth of their respective spathe and are covered in every part with a brown scaly scurf. The primary spathes are tubular, minutely and appressedly furfuraceous, and all densely barbed at the mouth with stiff, black, shining bristles; the lowest spathe much flattened, two-keeled, the keels bearing rather long subbristly spines; the upper spathes somewhat inflated, carinate and spinose on the back, terminating in a short triangular point; the lowest partial inflorescences are the largest: they are 7–8 cm. long with only 3–4 spikelets on each side; secondary spathes infundibuliform, truncate at the mouth and slightly prolonged at one side, furnished at the summit with a few long stiff bristles; spikelets short and rather thick, 2–4·5 cm. long, with two series of 6–9 somewhat assurgent (not flatly bifarious) flowers; spathels very shortly infundibuliform, embracing the involucre; involucrophorum and involucre which are very much alike, very shallowly cupular, and orbicular; areola of the neuter flower depressedly lunate and sharply bordered. *Female flowers* conical

5 mm. long and 5 mm. broad, the form of the flower being given by the calyx, which has a very broad, flat, callous base and a very contracted, shortly 3-toothed mouth, the teeth about as long as the small segments of the corolla; stigmata small, triangular, spreading. *Fruit* spherical, rather large, 2 cm. in diameter, shortly beaked; scales in 18 longitudinal series, deeply grooved along the centre, exactly rhomboidal, slightly broader than long (the largest 6 mm. broad, 5 mm. long) of a dirty straw colour, edged by a very narrow black line, the margins very minutely erosely toothed, the point obtuse. *Seed* globular-oblong, 17 mm. long, 15 mm. broad, rounded at both ends, enveloped by a rather thick fleshy integument under which the surface is minutely pitted; albumen deeply ruminated.

HABITAT.—The Philippines. The type specimen was collected at Ranohao, Province of Laguna in Luzon, by *Loher* (No. 7088 in the Herbarium at Kew); vernacular name "Saba-ang." It has been since found again in fruit by *C. B. Robinson* on Mount Binuang (alt. 900 m.), Province of Tayabas, Luzon (No. 9448 in Herb. Manila); Tagalog name "Uay." According to a note of the collector the stem is 4·5 cm. in diameter; the plant 6 m. high; the leaves have 15 pairs of leaflets.

OBSERVATIONS.—A very fine species, with a quite peculiar habit, easily distinguishable by its short, straight, rigid, female spadix, by its spathes fringed at the mouth with numerous stiff, subspiny bristles, also by its large leaves with lanceolate pluricostulate leaflets, and by the large spherical fruit with a ruminate seed. In the fruit it approaches *C. macrosphaerion* Becc.

SUPPL. PLATE 53.—Calamus grandifolius *Becc.* Upper portion of a leaf-sheath and petiolar part of a leaf; intermediate portion of a leaf, upper surface; female spadix in flower, its basal part only is wanting. From Loher's type specimen No. 7088 in the Herbarium at Kew.

148. CALAMUS SPINIFOLIUS BECC. Add:—Becc. in Webbia di U. Martelli, 348.

Specimens in fruit have been for the first time collected on the Lamao River, Mount Mariveles, Province of Bataan, Luzon, by *Aher's collector*, No. 1454 in the Herbarium at Manila, and I subjoin the description of them.

The *female spadix* is simply branched and rather small, thinly and fugaciously rusty furfuraceous, diffusedly panicled, non-cirriferous, 35 cm. long (in one specimen), divided into only 4 gradually diminishing branches or partial inflorescences; primary spathes somewhat flattened, dorsally keeled and prickly on the keel, closely sheathing, slightly enlarged above, obliquely truncate and smooth at the mouths, and produced into a short, triangular, acute or acuminate point; the lowest primary spathe is somewhat longer than those following (8 cm. long), otherwise similar to the latter; the partial inflorescences are inserted outside the mouths of their respective spathes, are spreading and bear very few spikelets; the lowest inflorescence has only 4 spikelets on each side, and is about 20 cm. long: the others are gradually smaller and have fewer spikelets; secondary spathes very closely sheathing, tubular, slightly enlarged above or very narrowly infundibuliform, usually smooth, but

at times armed with straggling spinules, truncate and glabrous at the mouths, apiculate at one side; spikelets inserted outside the mouths of their respective spathes, spreading, slender, zig-zag sinuous between the flowers, all of about the same length, 5–6 cm. long, with relatively few (6–8) rather distant flowers on each side; spathels infundibular, truncate at the mouths, produced at one side into triangular acute points, sprinkled with rusty scales; involucrophorum attached outside its own spathel at the base of the one above, concave, deeply excavate and bidentate on the side next to the axis; involucre immersed in the involucrophorum, irregularly cupular; areola distinctly lunate. *Fruiting perianth* almost explanate; the calyx slightly callous at the base, divided down to the base into 3 ovate-lanceolate acuminate lobes; the segments of the corolla lanceolate, about as long as the lobes of the calyx. *Fruit* exactly spherical, shortly beaked, 10–11 mm. in diameter; scales in 18 longitudinal series, squarrose, thin, flat, very faintly grooved along the centre, of a dirty straw-colour, lighter on the edges, the point reddish, and slightly produced; margins distinctly erose-toothed. *Seed* globular, boldly tubercled and deeply pitted; the albumen rendered ruminate by the intrusion of the integument within the pits. The *leaves*, united to the fruiting spadix and belonging to the upper part of the stem, are 50–65 cm. long in the pinniferous part, and have a very short petiolar part; the leaflets are usually furnished with one rigid erect spine only on the upper surface of the mid-costa, but at times these spines number 2–3 or are wanting altogether. The sheathed stem is about 2 cm. in diameter. In a male specimen collected by *Curran* in Luzon, Province of Bataan (No. 17309 in the Herbarium at Manila), the leaflets are quite smooth on both surfaces, and have only a few small spinules on the margins.

148*a*. CALAMUS DISTICHUS Ridley, Mat. Fl. Mal. Penins. ii, 206.

DESCRIPTION.—Slender and scandent. *Sheathed stem* about 15 mm. in diameter. *Leaf-sheaths* armed with flat spines about 15 mm. long (Ridley). The *leaves* terminate in a slender clawed cirrus, are about 30 cm. long in the pinniferous part and have several pairs of leaflets on each side of the rachis; petiole very short (3–4·5 cm. long) armed on the edges with short, strong spines (Ridley); the rachis in its upper portion of the upper surface is bifaced and has an acute smooth salient angle while underneath it is armed with several solitary, scattered, very small claws; leaflets geminate or in pairs, 5–7 cm. apart, on each side of the rachis (the two of each pair very approximate by their rather acute bases and divergent) conspicuously concave-convex or cochleariform, elliptical, almost equally narrowed to both ends, rather suddenly acuminate to a non-bristly tip, the tip itself often bidenticulate, papyraceous, rigidulous, green, slightly paler underneath than above, with 5–7 very slender costae slightly prominent on the upper surface; the central costa barely stronger than the side ones, all quite glabrous and smooth on both surfaces; transverse veinlets numerous, rather continuous and very sharp; the margins very inconspicuously scabrid when seen under a lens; all leaflets, even those of the terminal pair, are of about the same size, 11–12 cm. long, 2·5–3 cm. broad. *Male spadix* not cirriferous, very slender, about 75 cm. long, simply decompound, with only 4 partial inflorescences; it terminates in a small, very slender, flattened, tail-like, smooth appendage 4 cm. long; primary spathes elongate-tubular, very closely sheathing, the lowest 18 cm. long, strongly flattened, very

acutely two-edged; the apex produced into a triangular acutely keeled point and armed at the base with feeble, straight, schistaceous spines, and with a few other smaller ascendent spines on the margins, otherwise smooth on both surfaces; upper primary spathes also more or less flattened, narrow lower down, and gradually passing into the very elongate slender plano-convex axial part; the mouth of these spathes is obliquely truncate, entire, glabrous, produced at one side into an acuminate point, is feebly armed with a few, weak, straight spines, or quite smooth; partial inflorescences are erect, non-callous at their insertion and have a very slender axis; the lower ones are 20–30 cm. long and have only 3–4 spikelets on each side; secondary spathes very narrow and elongate, very closely-sheathing, dorsally keeled, smooth, otherwise very similar to the primary ones; spikelets spreading, inserted above the mouth of their spathes: the lower (largest) are 4–5 cm. long, and have about 10 flowers on each side: the upper are somewhat shorter; spathels unilaterally infundibuliform, finely striately-veined, glabrous, greenish, produced at one side into a short triangular, scarious, more or less split point; involucre immersed within its own spathel, cupular, obtusely bidentate on the side next to the axis. *Male flowers* flatly bifarious, inserted at an angle of 45°, ovoid, acute, obtusely trigonous; the calyx shortly campanulate, obscurely striately veined with a flattish polished base, divided down to about the middle into 3 broadly triangular lobes; the corolla twice as long as the calyx, deeply divided into 3 lanceolate, acuminate, externally striate segments. *Female spadix* and *fruit* unknown.

HABITAT.—The Malayan Peninsula: State of Selangor, Hulu Semangkok, collected in August 1904 by *Ridley*, who sent me a specimen of it under No. 12116, but this number in the "Materials" is given to *C. lanatus*, while *C. distichus* bears No. 12115.

OBSERVATIONS.—I have seen a leaf wanting its basal part, and an entire male spadix of this species. It belongs to the group of *C. palustris* and therefore has cirriferous leaves, and non-flagelliferous leaf-sheaths. It is distinguishable by its leaflets which stand in pairs on each side of the rachis, the bases of each pair being in contact and thence divergent, smooth on the nerves and on the margins, and as broad as those of the intermediate forms of *C. javensis*, strongly concavo-convex and pluricostulate.

SUPPL. PLATE 54.—Calamus distichus *Ridley*. Upper end of a leaf; an entire male spadix. From Ridley's specimen in Herb. Beccari.

149. CALAMUS TRISPERMUS Becc. Add:—Becc. in Webbia di U. Martelli, i, 349.

The following description, which completes that already given at page 412 of this volume, is based on a specimen preserved in the Herbarium at Kew, collected by *Loher* (No. 7071), at Montalban, Province of Rizal in Luzon.

It is a scandent and robust species. The *sheathed stem* is 5–6 cm. and the naked canes 2·5 cm. in diameter. The leaf-sheaths are rather thick and woody, more or less covered with tobacco-coloured very appressed and almost immersed scales, and are strongly gibbous above, obliquely-truncate at the mouth, which is entire, has a sharp margin and is more or less furnished with spines; they are also armed,

especially on their upper part, above the gibbosity, with rather robust, scattered, horizontal, short (5–10 mm. long) spines, which leave a very distinct impression on the surface of the sheath and have a broad base which is concave on the lower and convex on the upper surface; the ligule is represented by a short rim inside the mouth of the sheath. One *leaf* from a full grown plant is about 2·2 m. long in the pinniferous part and terminates in a rather long, very robust cirrus; the petiolar part is very short, 2·5 cm. broad at its base, flattish and covered with small erect prickles above, rounded and smooth beneath, and with acute and more or less prickly margins; the rachis is flattish and also prickly above in its first portion, but higher up becomes convex, and towards the extremity has an obtuse salient angle: beneath it is slightly convex, more or less covered with rusty scales, and armed towards the upper extremity of the pinniferous part with at first solitary, then ternate, and finally half-whorled, very robust claws; in the cirrus these half- or three-quarter whorls are regularly spaced 3–4 cm. apart. The leaflets are about 30 on each side, rather regularly alternate, and equidistantly placed 3–6 cm. apart, towards the end even more: they are rigidulously papyraceous, green, smooth on the nerves and concolorous on both surfaces, somewhat concavo-convex, lanceolate or elliptical-lanceolate, acuminate with the tip bristly; the mesial leaflets are 30 cm. long or thereabout and 5–7 cm. broad: those of the extremities are smaller: all are 5-costulate, with a few secondary rather distinct nerves interposed between the costae; transverse veinlets very crowded and numerous; the margins spinulous near the base, the spinules gradually passing into rigid spreading hairs near the apex. *Female spadix* rather diffuse, 70 cm. long, slightly nodding, with a rather rigid axis and with only 4–5 partial spreading inflorescences; the primary spathes tightly-sheathing, fugaciously rusty-furfuraceous, elongate-infundibuliform, armed with small short claws in their upper part; the lowest spathe is 20 cm. long, 18 mm. broad at the mouth, flattened, very sharply two-edged, entire and obliquely truncate at the mouth, which is fringed with small rusty paleolae and is produced at one side into a triangular acutely-keeled point; the other primary spathes are entire, 7–10 cm. long, narrowing towards the base, where they are flat with sharp margins on the inner side, and are prolonged at the apex into a triangular acutely-keeled point; the partial inflorescences are 20–35 cm. in length, have only 3–4 spikelets on each side, and terminate in a small, angular, tail-like appendage; the spikelets are 7–12 cm. long, otherwise as already described.

The type specimen of *C. trispermus* (Merrill's No. 1645 Herb. Manila) differs from that of Loher only in the more elongate spikelets; the discrepancies which may be noted in the descriptions of the leaves of the two are due to the fact that the leaf of Loher's specimen is one of the upper part of a full-grown plant, where the leaves have almost equidistant leaflets, while the leaf of Merrill's specimen was probably from the lower part of the stem, or that of a young plant, where apparently the leaflets are approximate in pairs.

150. CALAMUS MANILLENSIS H. Wendl. Add:—Becc. in Webbia di U. Martelli, i (1905) 349.

Mr. A. D. E. Elmer has collected of this, as yet very imperfectly known species, a fine and complete fruiting specimen in the Island of Mindanao, at Todaya

on Mount Apo, District of Davao, at 1150 m. elevation (*Elmer* No. 10560, May 1909, specimens with almost mature fruits, native name "Lintocan;") and in the same locality, in dense humid forests along the Mainit Creek at about 1200 m. (*Elmer* No. 11714, September 1909, specimens with young fruits, native name "Sarani").

It is described by Elmer as looping and climbing to the tops of the highest trees and extending occasionally far beyond them. It is a large and robust kind, with sheathed stems 5–5·5 cm. in diameter. The naked canes are about 3 cm. in diameter, hard, with a smooth yellowish surface and with internodes 25–30 cm. long. *Leafsheaths* strongly gibbous above, armed with numerous, scattered, small spines, having a short (2–4 mm. long) sharp point resting on a bulbous base; ligula very short, glabrous. *Leaves* large, 2·5–3 m. long in the pinniferous part, and terminating in a robust clawed cirrus about as long; the petiolar part is flattened, about 45 cm. long, 3 cm. broad at its base, somewhat convex below, prickly, especially on its lower portion, and more strongly near the margins, and smooth along the central line; on the upper surface it is flat at the base, slightly convex higher up and densely covered throughout with rigid, blackish, unequal, very small, or at most 8–10 mm. long, slightly ascendant spines; the rachis is slightly convex on the upper surface, and also densely prickly from the base to about the middle, but higher up becomes almost smooth and strongly convex, finally exhibiting a not very sharp salient angle, to which are attached the ultimate leaflets; on the under surface the rachis is slightly convex and armed near the end of the pinniferous part only with at first solitary, then ternate, and finally half-whorled very robust claws; on the long and strong cirrus, the half-or three-quarter whorls of robust claws are almost regularly 4–5 cm. apart. The *leaflets* are rather numerous, inserted at an angle of about 45°, not very approximate, almost equidistant, alternate or subopposite; on the lower and intermediate portion they are 6–8 cm. apart on each side, higher up more distant; they are papyraceous, tough and rigid, corrugated or plicate longitudinally, dull concolorous on both surfaces, narrowly-lanceolate, almost equally attenuate towards both ends, the base acute, gradually acuminate above to a rigid very coarsely bristly apex, obscurely 5–7-costulate, or perhaps they may be said to be 1-costate with 2–3 secondary nerves on each side; the mid-costa is slender and sharp, with usually 1–3 conspicuous rigid spinules on the upper surface at the base, otherwise all nerves are smooth on both surfaces; transverse veinlets very numerous, sharp and almost continuous across the blade; the margins rather remotely ciliate with rigid appressed spinules; the intermediate leaflets about 50 cm. long, 4–4·5 mm. broad: the lower narrower and slightly shorter: the uppermost considerably smaller. *Male spadix* . . . . *Female spadix* inserted near the mouth of its leaf-sheath, and spuriously axillary: it forms a large, diffuse, non-flagelliferous panicle, 1–1·5 m. long, branched into several partial inflorescences; primary spathes tightly sheathing, armed rather densely with very small, subbulbous, straight prickles; the lowest spathe somewhat flattened, 15–25 cm. long, 3 cm. broad, above very sharply edged or almost two-winged; the upper spathes are elongate-infundibuliform, entire, truncate and glabrous at the mouths and produced on one side to a dorsally keeled acuminate point; the partial inflorescences rise erect from inside, but near, the mouth of their respective spathes, and are then spreading arched: the lower ones are 70–80 cm. long and carry a few (6–8 on each side), rather distant spikelets, and terminate in a

small tail-like prickly appendage; secondary spathes tubular, 5–7 cm. long, closely sheathing, obliquely truncate, entire and glabrous at the mouths, produced at one side into a short triangular point, armed especially on their upper part, with very small often deflexed prickles, terete above, and concavo-convex in their lower part; spikelets inserted just at the mouths of their respective spathes: those of the lower part of the partial inflorescences 15–16 cm. long, and with 12–13 flowers on each side, the others gradually smaller. Other parts exactly as already described.

Elmer's specimens differ very slightly from the typical ones (which are represented by two fruiting spikelets only) by their shorter spikelets with fewer fruits, by the spathels being less distinctly ciliate or sometimes glabous, and by the fruit being slightly smaller (14 mm. in diameter) and with a more prominent mucro. The fresh fruit is described by Elmer in his field notes as "yellowish white except the brown-margined scales, edible but very sour."

SUPPL. PLATE 55.—Calamus manillensis *H. Wendl.*—Portion of the sheathed stem; portion of the spadix with mature fruits; leaflets (from Elmer's No. 11714 in Herb. Beccari); spikelet with almost full grown fruits from Elmer's No. 10560 in Herb. Beccari.

152. CALAMUS NEGLECTUS Becc. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 212.

I have recognized this rare and very little known *Calamus* in a specimen preserved in the Herbarium at Calcutta, collected by Ridley (No. 3495) in Selangor at Kwala Lumpur. Ridley writes of *C. neglectus* Becc. that it was "founded on some unrecognizable scraps in Griffith's Malacca Herbarium, probably bits of *C. palustris*," but as may be seen in plate 182 of this volume, *C neglectus* is a plant quite different from *C. palustris* and approaches only *C. brevispadix* and *C. viridispinus.*

The above mentioned specimen consists of the summit of two leaves, and of a partial inflorescence with thoroughly mature fruits. In the type specimen the leaf terminates in a small cirrus; but in the leaves of the present specimen the leaflets gradually diminish in size above and the uppermost are almost rudimentary, as occurs in other species that have occasionally cirriferous and non-cirriferous leaves; otherwise the leaves agree exactly with the description already given, only the largest leaflets among those at hand are 25 cm. long and 13 mm. broad. The *fruit* is ovoid-elliptical, suddenly surmounted by a conspicuous mucro, is 15–16 mm. long, not taking the mucro and the fruiting perianth into account, and 11 mm. broad; the mucro is 3 mm. long; scales in 18 series, slightly convex, very faintly grooved along the centre, straw-coloured with a dark red-brown marginal line, which broadens towards the somewhat prolonged, triangular, not very appressed, erosely toothed tip. On the whole the pericarp is very thin and brittle. *Seed* ovoid-elliptical, slightly flattened, rounded at both ends, 11 mm. long, 8 mm. broad, 7 mm. thick, rather closely deeply pitted and obsoletely tubercled all round; chalazal fovea central, narrow, rather deep; albumen rendered ruminate on the periphery by the integument penetrating into the pits; embryo central on the side opposite to the chalaza. *Fruiting perianth* broadly campanulate, subpedicelliform.

In the type specimen the fruit was immature, and consequently the description given of it on page 417 of this volume is not correct.

SUPPL. PLATE 56.—Calamus neglectus *Becc.* Apex of a leaf, and partial inflorescences with mature fruits and detached seeds; from Ridley No. 3495 in the Herbarium at Calcutta.

153. CALAMUS BREVISPADIX Ridley, Mat. Fl. Mal. Penins. ii, (1907), 207.

C. bubuensis Becc. in Ann. Roy. Bot. Gard. Calc. xi, (1909), 417, pl. 183-male plant.

C. elegans Becc. mss. ex Ridl. l. c, p. 207, in regard to Wray's No. 3923 only.

C. bubuensis Becc. which was founded on Wray's No. 3923 is the male plant of *C. brevispadix* Ridley, which name has the right of priority, as it was published while my monograph was still in the press. Ridley's specimens have the *sheathed stem* 1·5—2 cm. in diameter, and on the whole appear more robust than those of Wray; the leaf-sheaths are densely armed with very unequal, subhorizontal or slightly deflexed spines, some as much as 2 cm. long, and those near their mouth even longer but erect. The *leaves* have the petiole about 30 cm. long, relatively robust, 7–8 mm. broad, convex beneath, channelled above, with the margins obtuse and armed with unequal spines, of which several are 15–20 mm. long, rigid, dagger-shaped; the rachis has underneath a few solitary scattered claws, or is almost smooth; the cirrus is slender; leaflets in subopposite groups of 4 to 6, with interposed nude spaces of variable length between the groups, very narrowly-lanceolate, 25–30 cm. long, 15–18 mm. wide in their broadest part: about the middle or a little below they are tricostulate, the mid-costa acute, and prominent and the side-costae very slender; the three costae carry a few short bristles towards the apex on the upper surface, and are quite smooth on the lower; the margins are usually smooth or nearly so from about the middle to the base, and are very minutely, remotely, and inconspicuously spinulous above. *Female spadix* 60–70 cm. long, rigidulous, straight, slender, simply decompound, with 3–5 gradually diminishing partial inflorescences; the peduncular part is strongly flattened, 20–30 cm. long and about 4 mm. broad; it has very sharp edges armed with small fascicled spines; otherwise all the other parts of the spadix are unarmed or nearly so; primary spathes tubular, very narrowly infundibuliform, slender and flattened at the base, papyraceous, rather loose in their upper part, entire, glabrous, entire and very obliquely-truncate at the mouth, prolonged at one side into a triangular, acuminate, dorsally-keeled and erect point; the lowest spathe 6–10 cm. long, flattened with acute smooth edges; the upper spathes shorter and less flattened; partial inflorescences emerge erect from the mouth of their respective spathes; the lower ones 10–12 cm. long with very few spikelets; the upper ones smaller and reduced to very few spikelets; secondary spathes very narrowly tubular-infundibuliform, closely sheathing; spikelets spreading, attached at or a little above the mouth of their respective spathes with a distinct axillary callus, 3–7 cm. long, with 6–12 flatly not very approximate (3–5 mm. apart) bifarious flowers on each side; spathels broadly unilaterally infundibuliform, ciliolate at the mouths, prolonged at one side into a short triangular point; involucrophorum laterally adnate outside its own spathel at the base of the one above, with a very short annular limb; involucre cupular, truncate; areola of the neuter flower very distinct, lunate, sharply

edged. *Female flowers* conical, at the time of the anthesis 5 mm. long; the calyx striately veined, shortly 3–toothed; the lobes of the corolla acute, very slightly longer than the calyx; stigmata circinate, slender, conspicuously projecting beyond the narrow apex of the corolla. *Fruit* ovoid–elliptical, distinctly conically beaked, about 1 cm. long (perianth and beak included); scales in 12 longitudinal series, concolorous, blackish, narrowly and deeply grooved along the centre, the point triangular bluntish, the margins very narrowly scarious and very minutely erose ciliolate. *Seed* ovoid–elliptic, its surface even (not pitted); chalazal fovea orbicular in the centre of the raphal side; embryo about central on the other side; albumen equable. *Fruiting perianth* campanulate, slightly pedicelliform from the hardened and subcallous base of the calyx, which is deeply split into 3 lobes, broader than the segments of the slightly longer corolla.

C. brevispadix is rather closely related to *C. viridispinus*, from which it differs in its shorter and more stiff spadix and in its fruit with blackish scales. In *C. viridispinus* the scales are light straw–coloured.

Wray's No. 3923, upon which I had founded *C. bubuensis* and of which I have seen other more complete specimens than that figured in my plate 183, differs from Ridley's type of *C. brevispadix* in being somewhat smaller in every part, in having the leaflets with smooth margins and nerves, and perhaps also in the female flowers slightly shorter and more broadly conical. I probably applied provisionally the name of *C. elegans* to Wray's specimens in the Herbarium at Kew.

Ridley collected his specimens of *C. brevispadix* (No. 12121) in Selangor, Semangkok Pass, at about 1,200 m. elevation.

Suppl. Plate 57. Calamus brevispadix *Ridley*.—Fruiting spadix; female spadix in flower; upper part of a leaf–sheath and petiole; intermediate portion of a leaf. From Ridley's No. 1<121 in the Herbarium at Singapore.

154. Calamus viridispinus Becc. Add:—Ridley, Mat. Fl. Mal. Penin. ii, 207.

C. elegans Ridl. l.c, as to Scortechini's No. 316 only.

C. elegans Becc. mss. ex Ridley l.c. as regard Wray's No. 3923, of which I had made a *C. bubuensis*, is the male plant of *C. brevispadix*, as I have already explained under this species.

155. Calamus mucronatus Becc.

To what I have already written about this graceful and very distinct species, I have now to add the description of the female spadix, from specimens collected by *H. Hallier* in Dutch N. W. Borneo at Gunong Semedum, Residency of Sambas (No. 704 in Buitenzorg Herbarium), and in Sarawak at Siul by *J. Hewitt* (in Kew Herbarium). The *female spadix* terminates in a very short, very slender, unarmed appendage, is shorter than the leaf above which it is inserted, and is 30–40 cm. long, with 3–5 small partial inflorescences; primary spathes elongate, tubular, strictly sheathing, smooth, or very slightly prickly, more or less fugaciously rusty-furfuraceous, ciliate-bearded at the mouth, and produced there at one side to an acuminate point; the partial inflorescences are 5–10 cm. long, and have few (4–7 in all) small spikelets;

secondary spathes tubular-infundibuliform, obliquely truncate, entire and ciliate at the mouths, and prolonged into a triangular acute point; spikelets inserted at the mouth of their own spathes with a distinct axillary callus, very short (1—2 cm. long) and with 2–6 flowers on each side; spathels infundibuliform, hairy scabrid, produced at one side into a triangular point, which subtends their respective flowers; involucrophorum laterally adnate to the base of the spathel above its own and with a slightly concave irregular limb; involucre slightly concave, irregular, usually more or less distinctly 3-toothed; areola of the neuter flower lunate, marked after the fall of its flower by a conspicuous scar. *Female flowers* ovoid-conical, 3 mm. long; the calyx urceolate, finely striately-veined, 3-toothed; the corolla slightly protruding beyond the calyx; the stigmas, during the anthesis, protruding beyond the corolla and spreading. *Neuter flowers* similar to the female but slightly smaller. *Fruiting perianth* distinctly pedicelliform, 2 mm. long; the calyx callous at its base, 2 mm. thick, broadly 3-toothed; the segments of the corolla triangular, acute, slightly longer than the calyx. *Fruit* (from Hallier's No. 704) ovoid or slightly obovoid, beaked on a round top, 14–15 mm. long inclusive of the perianth and beak, about 8 mm. broad; the beak narrow, 2 mm. long; scales slightly squarrose, broader than long, arranged in 12–13 longitudinal rows, dull straw-coloured and tinged with red-brown at the obtuse point, not grooved but rather ridged along the centre.

In all other respects Hallier's specimens correspond to the type specimen figured in plate 185 of this volume. They have the sheathed stem 6 mm. and the naked canes 3·5–4 mm. in diameter; the internodes are 28 cm. long with a rather dull surface, slightly striate longitudinally; the spadix is slender; the secondary spathes are very slightly scabrid, and almost glabrous; the spikelets are very short, 8–10 mm. long and with very few flowers. The fruit is that described above.

Hewitt's specimen from Sarawak has the sheathed stem 8 mm. in diameter; the leaflets are 10–15 cm. long, 20–25 mm. broad; the female spadix is more rigid and more robust in every part than in Hallier's specimens; the secondary spathes and the spathels are densely hairy-scabrid; the spikelets are 1·5-2 cm. long, and have 4–5 flowers on each side. The female flowers are described from this specimen.

Another specimen from Sarawak, also collected by Hewitt at Siul, has a fruiting spadix 40 cm. long with 3 partial inflorescences which are 10–12 cm. long, and carry 10–13 spikelets in all, otherwise as described above; the fruits are ovoid-elliptical, or subobovoid-elliptical, 11–12 mm. long, and 6–7 mm. broad, but they are not entirely mature.

155*a*. CALAMUS WINKLERIANUS Becc. in Bot. Jahrb. xlviii, (1912), 91.

DESCRIPTION.—Scandent, rather slender. *Sheathed stem* about 2·5 cm. in diameter. *Leaf-sheaths* not flagelliferous, obliquely truncate at the mouth, covered, at first, with very minute ferruginous scales, ultimately glabrous, of a straw colour when dry, slightly transversely puckered above, armed with scattered, rather short, 15–10 mm. long, broad-based, horizontal or slightly deflexed spines. *Ocrea* short, liguliform, densely bearded. *Leaves* cirriferous, about 60 cm. long in the pinniferous part; the cirrus about as long, armed rather closely and almost regularly with

half-whorls of rather delicate, very sharp, black-tipped claws; petiole very short, or almost obsolete; the rachis in its lowest part is about 5 mm. broad, depressed, with the upper surface flat, the lower convex, and the edges obtuse; higher up it becomes bifaced on the upper surface with the salient angle smooth; the lower surface is rather irregularly armed, especially on its lower portion, with rather robust claws. *Leaflets* not very numerous (12–13 on each side), very inequisdistant, often approximate in pairs on each side of the rachis, with rather long vacant spaces interposed between the pairs; they are papyraceous, rigidulous, glabrous, dull, concolorous, and of a greenish-yellow colour (when dry) on both surfaces: those near the base are linear, very narrow but larger towards the upper end: the mesials (largest) are narrowly oblanceolate, or very narrowly spathulate, plicately 5–costulate, 16–22 cm. long, 20–23 mm. wide in their broadest part (above the middle, or not very far from the apex) and thence gradually taper down to an acute base: their upper ends are suddenly narrowed into a more or less produced narrow acuminate mucro or tip, which is quite bald or has 1–2 subspiny (deciduous?) bristles at its apex, the costae slender and smooth on both surfaces; transverse veinlets fine, much interrupted, margins perfectly smooth. *Male spadix* about 80 cm. long, covered with a thin rusty-furfuraceous, removable, and partly deciduous indumentum, springing erect from about midway of the sheaths, then nodding, not flagelliferous at its apex, which terminates in a slender tail-like appendage, ultra-decompound or at times almost simply decompound, with 10–11 partial inflorescences; primary spathes 6–7 cm. long: the lowest not longer than the others, tubular, slightly infundibuliform or somewhat enlarged and rather loosely sheathing in their upper part, armed more or less on the back with short claws, narrowed to the base into a short smooth axial part, which is concave on the inner and convex on the external side, obliquely truncate, bearded or very densely ciliate at the mouth with long, light-coloured hairs, and produced at one side into a lanceolate-acuminate, and also bearded point; partial inflorescences inserted at the mouth of their own spathes, spreading and arched: the lower are 12–15 cm. long and have several compound spikelets on each side: the upper gradually smaller; secondary spathes elongate-infundibuliform, unarmed, covered with rusty-furfuraceous scales, obliquely truncate and conspicuously ciliate at the mouth, prolonged at one side into a rather acute tip; the primary, or compound spikelets are spreading, arched or subscorpioid; those of the lower part of the partial inflorescences are 2–4 cm. long, and carry 8–10 gradually diminishing secondary spikelets on each side; in the upper part the spikelets are gradually smaller; at times the partial inflorescences bear only a few compound spikelets in their lower part and all the others are simple; the secondary spikelets are very small, 3–5 mm. long, circinate-scorpioid, and have 3–5 very closely packed flowers on each side; spathels very approximate, bracteiform, concave, broadly ovate, acute or acuminate, strongly deflexed and subtending their flowers; involucre slightly concave, transversely evolute and apparently formed by two triangular, divaricate, acute bracts connate by their bases; spathels and involucra reddish-brown, scaly-furfuraceous, strongly striately veined, and ciliate. *Male flowers* small, 2 mm. long, ovoid subtrigonous; the calyx briefly subcampanulate, strongly striately veined, parted midway down into 3 very broad acute lobes; the corolla about twice as long as the calyx, dull outside. *Female spadix* . . . .

HABITAT.—S. W. Borneo on the River Passir, between Simpokak and Semurong, *H. Winkler* No. 3012.

OBSERVATIONS.—It is related to *C. mucronatus*, from which it differs by it considerably larger size and by the ultra-decompound male spadix, or with partial inflorescences bearing compound spikelets. It is evidently the representative form of *C. mucronatus* in the east of the island. The mouths of the secondary spathes are uncommonly ciliate-bearded.

SUPPL. PLATE 58.—Calamus Winklerianus *Becc.*—Leaf-sheath with the base of a leaf bearing an entire male spadix; an entire leaf; leaf-sheath and base of a loaf. From Winkler's No. 3012.

158. CALAMUS OPTIMUS Becc.

The specimen figured in plate 188 of this volume may possibly represent the not yet full grown plant of *C. caesius*, which has been collected with fruits in Sarawak and in other places in Borneo, and which is also known under the native name of "Rotang Segah." In the original specimen of *C. optimus* however there is not any sign of the leaflets becoming geminate on each side of the rachis.

159. CALAMUS CAESIUS Bl. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 206.

To the localities add:—Sumatra: in the Residency of Palembang (*J. A. van Rijn van Alkemade* in Herb. Martelli). N. W. Borneo: in Sarawak at Quop (*J. Hewitt* in Kew Herbarium). On the Barito in central Borneo (Buitenzorg Herbarium). Cultivated at Samarinda on the River Coti or Kutei, collected by *H. Winkler* No. 3124. It is also cultivated in Sumatra and at Johor according to Ridley. It produces one of the best kinds of rattan canes, highly valued by traders. Vernacular name "Rotang Sega," "Rotan Segar," "Rotang Sega botol" or the true "Rotang Sega."

Hewitt's Sarawak specimen differs from those of the Malayan Peninsula only in the fruit being slightly larger (20 mm. long, including beak and perianth, 13–13·5 mm. broad), with slightly larger scales, arranged in 16–17 series. Winkler's specimens from Samarinda have fruits slightly longer (22 mm.) than those of the plant from the Malayan Peninsula but not broader. The seed is narrowly elliptical, 14 mm. long, 7 mm. broad, rounded at the base, subacute at the apex. The embryo is lateral, placed a little below the middle. All specimens have constantly the leaflets geminate on each side of the rachis; and conspicuously glaucous below. One of Winkler's specimens, which exactly corresponds in the vegetative organs to the type figured in plate 189, has the *male spadix* very long (2·5 m.), supradecompound, pendulous, very flaccid and terminating in a short, very slender, very finely clawed filament; it bears 9–10 pendulous, flaccid, partial inflorescences, of which the lower are about 1 m. long and bear 18–20 alternate spikelet-bearing branchelets; the uppermost partial inflorescences are much shorter (20–30 cm. long) and have proportionally fewer branchlets; primary spathes very elongate, tubular, closely sheathing, sprinkled with small prickles, obliquely truncate and ciliolate at the mouth, produced at one side into a triangular acuminate point; the secondary spathes are 3–5 cm. long, are smooth or have a very few, very small prickles, are tubular and narrowly infundibuliform in their upper part, entire,

truncate at the mouths and produced at the upper end into a triangular point, concave or deeply grooved on the axial side in their lower part; spikelet-bearing branchlets inserted just at the mouths of their respective spathes with a distinct axillary callus, deflexed; the lower branchlets are 12–14 cm. long and carry 9–10 spikelets on each side; the others are gradually smaller and have fewer spikelets; spathels of the branchelets infundibuliform, truncate and ciliolate at the mouths, shortly apiculate at one side; spikelets spreading or deflexed, short, pectinate with very closely packed, flatly-bifarious flowers; the largest spikelets 12–15 mm. long with 8–10 flowers on each side; spathels concave, boat-shaped, ciliolate, horizontal, acute on the outer side; involucre shorter than its own spathel, dimidiately cupular or like a swallow's nest. *Flowers* perfectly bifarious, horizontal, one in contact with the other, linear, subterete or very obsoletely trigonus, bluntish, about 4 mm. long, 1 mm. thick; the calyx thinly coriaceous, deeply 3–lobed, smooth; the corolla two and a half or nearly three times as long as the calyx; the segments smooth.

159*a*. CALAMUS POGONACANTHUS. Becc. in Bot. Jahrb xlviii (1912), 91.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* 2·5 cm. in diameter. *Leafsheaths* conspicuously transversely puckered above, obliquely truncate at the mouths, the edges of which are densely hairy spinulous; the surface of the leaf-sheath is rather densely armed with very unequal spines, of which a considerable number are rather large, scattered or obliquely subseriate, slightly ascendent or subhorizontal, triangular, very sharp, thinly laminar, yet very rigid, 10–15 mm. long, 6–10 mm. broad at the base, which is concave below, dark-brown or blackish, glossy, conspicuously and densely fringed or bearded with darker hairs on the edges; intermingled with these large spines are others more numerous and smaller, but of the same description and equally bearded on the edges. The leaf-sheaths of the upper part of the plant, when not bearing spadices, are furnished with a rudimentary flagellum, 10–12 cm. long, very slender, flatttened and prickly. *Leaves* cirriferous, about 1·5 m. long in the pinniferous part; the cirrus about as long, rather robust, extremely closely and irregularly armed on its lower surface with scattered (neither digitate nor half-whorled) very sharp, black-tipped claws; the petiole is rather short (14 cm. long, 12–13 mm. broad in one specimen), polished, flat on the upper surface, convex on the lower, the margins acute, armed with small prickles; rachis, in its lower portion, biconvex and deeply grooved along the sides for the insertion of the leaflets, bifaced higher up on the upper surface, with a smooth salient angle, armed throughout on the lower with numerous, solitary, scattered (never digitate) small claws. *Leaflets* rather numerous (36 on each side in one specimen) inequidistant, yet not distinctly grouped, usually spaced 3–5 cm. on each side, at times even 10–12 cm., papyraceous, rather flaccid, dull and concolorous on both surfaces, with a narrow glossy band on the lower margin of the upper, narrowly oblanceolate or linear-lanceolate, usually broader above the middle, and thence narrowing towards the base, above rather suddenly acuminate to a fine subulate minutely ciliate apex, 5-costulate; the 5 costae on the upper surface and at times also one or two secondary nerves are furnished with short black bristles, and on the lower surface 7–9 nerves are also sprinkled with the same kind of bristles; the margins are very minutely and appressedly spinulous; transverse,

veinlets sharp, and much interrupted; the largest leaflets are the mesials, about 35 cm. long, 22–24 mm. broad: those near the base are narrower, and slightly shorter: those near the end shorter, yet not narrower. ***Male spadix.*** . . ***Female spadix*** rather elongate, but somewhat shorter than the leaves (1·2 m. in one specimen), attached about midway of its sheath, rigid and erect in its lowest part, nodding and flaccid in the remaining portion; it is non-cirriferous at its upper end, and bears only 4 rather large, loose, partial inflorescences; primary spathes tubular, closely sheathing; the lowest strongly flattened, 12 cm. long, acutely two-edged, very obliquely-truncate at the mouth, produced at one side into a triangular point, densely covered with ascendent, very small spines but of the same kind as those of the leaf-sheaths; the second spathe is only slightly flattened and is armed with very small hooked prickles; the upper primary spathes are more or less cylindrical, are 12–15 cm. long, slightly enlarged above, more or less prickly on the back, obliquely truncate at the mouths, which are ciliated with deciduous black hairs, and are produced at the apex into a triangular acute point; the partial inflorescences are inserted just at the mouth of their respective spathes, from which they spring erect, and then become nodding: the lowest is 50 cm. long, bears 8 distant spikelets on each side, and terminates in a small, smooth tail-like appendage; the other partial inflorescences are somewhat smaller; secondary spathes tubular-infundibuliform about 3 cm. long, smooth, almost horizontally truncate, and deciduously ciliate at the mouth, produced at one side into a short triangular point; spikelets inserted just at the mouths of their respective spathes, vermicular, spreading, slightly sinuous; the lower spikelets (largest, 8–10 cm. long., 3 mm. thick in their axial parts, with 18–20 flowers on each side; upper spikelets not much smaller; spathes infundibuliform, exactly horizonally truncate, ciliolate at the mouth, very briefly produced and apiculate at one side, sprinkled with chocolate-brown scales; involucrophorum concave, laterally adnate to the base of the spathel above its own, bidentate on the side next to the axis; involucre rather deeply and unequally cupular, lunately excavate and bidentate on the side of the neuter flower; areola of the neuter flower conspicuous, lunate, sharply edged. ***Female flowers,*** judging from the fruiting perianth, small, about 3 mm. long. ***Fruiting perianth*** cyathiform or subpedicelliform, with the calyx split into 3 broad parts not quite to the base; the segments of the corolla barely longer than the calyx, acute. ***Fruit*** very small, globular, 5 mm. in diameter, surmounted by a relatively conspicuous and stout mucro, which is crowned with the narrow circinate stigmas; scales very numerous and very small, arranged in 24 longitudinal series, almost glossy, uniformly brown, with a narrow reddish margin, very appressed, convex, narrowly grooved along the centre, the point bluntish, scarious denticulate. ***Seed*** globular. The fruit I have described was not quite mature, but apparently had attained its definitive size.

Observations.—This *Calamus* belongs to the group XV—A of my monograph by its cirriferous leaves, non-flagelliferous leaf-sheaths, non-flagellferous spadices, non-pedicellate spikelets and sub-pedicelliform fruiting perianth, but it does not seem closely allied to any one of those already known. It is specially distinguishable by its leaf-sheaths armed with very peculiar, ascendent, laminar, triangular, fringed spines, and by the very small, globular, conspicuously beaked fruit.

SUPPL. PLATE 59.—Calamus pogonacanthus *Becc.*—Portion of the sheathed stem bearing the base of a fruiting spadix; detached partial inflorescence; lower portion of a leaf (under surface); intermediate portion of a leaf (upper surface). From Winkler's No. 2928.

159*b*. CALAMUS TRACHYCOLEUS Becc. n. sp.

DESCRIPTION.—Scandent, rather slender. *Sheathed stem* about 2 cm. in diameter. *Leaf-sheaths* gibbous above, very scabrid with innumerable, very small, rufous, ascendent, triangular-subulate spinules, having a lighter bulbous base; scattered among these small spines are a few others considerably larger, also ascendent or spreading, 10–12 mm. long at most, which impress their form on the surface of the sheath, that otherwise is rusty pulverulent throughout. *Leaves* cirriferous, about 1·30 m. long in the pinniferous part; the cirrus slender, irregularly armed with single or more or less aggregated small claws; the petiolar part is obsolete; rachis in its lower portion somewhat flattened and prickly on both surfaces, higher up thickish and obsoletely angular, sparingly clawed beneath; towards the end it has an obtuse salient angle above and is armed not very regularly with scattered or ternate claws below. *Leaflets* not very numerous, about 15 on each side (in one specimen), very inequidistant, and usually approximating in pairs on each side of the rachis, with long vacant spaces between the pairs; they are papyraceous, green on both surfaces, almost glossy above, dull beneath, narrowly lanceolate, equally tapering towards both ends, have the base acute, and are gradually acuminate above to a subulate bristly apex; they have 5–7 very slender costae, and are quite bare of bristles or spinules on both surfaces; transverse veinlets sharp, much interrupted and numerous; margins ciliate with small spreading spinules; the intermediate leaflets are 30–35 cm. long, 28–32 mm. broad; the upper ones are gradually smaller, and a few of those near the base are narrower. *Male spadix* . . . *Female spadix* apparently elongate and flaccid (only two partial inflorescences seen by me); primary spathes tubular, slightly enlarged above but closely sheathing, armed with small prickles along the central line on the outer side, flat or slightly concave, with sharp margins on their basal axial side, truncate at the mouths, and produced at one side into a sharp triangular point; partial inflorescences 50 cm. long, inserted above the mouths of their respective spathes with a conspicuous axillary callus; they carry about 10 spikelets on each side; secondary spathes smooth, similar to the primary, but considerably smaller (2–2·5 cm. long); spikelets inserted above the mouths of their respective spathes and kept deflexed by an axillary callus: the lower ones and largest 6—7 cm. long, bearing 10–12 rather distant flowers; the upper spikelets are gradually smaller but not considerably: they are vermicular with the axis 2 mm. in diameter and have the spathels infundibuliform, truncate, deciduously ciliate at their mouths, and produced at one side into a minute point; involucrophorum concave, laterally adnate to the base of the spathel above its own; involucre slightly protruding beyond the involucrophorum, very shallowly cupular, with a conspicuous callous tubercle in the centre; areola of the neuter flower lunate, sharply edged. *Fruit* ovoid-elliptical, distinctly beaked, 11–13 mm. long (not including the perianth), 8 mm. broad; scales arranged in 15 longitudinal series, glossy, of a light straw colour, narrowly edged with reddish-brown, convex, narrowly and deeply

grooved along the centre, the margins inconspicuously erosely toothed, the point very appressed, bluntish or slightly produced. *Seed* ovoid, oblong, rounded at both ends, 8 mm. long, subterete, 5 mm. thick; its surface pitted and superficially tubercled; chalazal fovea superficial, inconspicuous; embryo basal. *Fruiting perianth* very distinctly pedicelliform, terete, 2 mm. long.

HABITAT.—I received the specimens of this very distinct species from the Director of the Botanical Garden of Buitenzorg; they were collected on the Barito in Central Dutch Borneo.

OBSERVATIONS.—This *Calamus* is very distinct for its leaf-sheaths which are scabrid, like a coarse rasp, owing to the peculiar spinescence, very similar to that of *C. asperrimus.* It is, however, related to *C. pogonacanthus*, from which it is distinguishable by its very irregularly set pluricostulate leaflets, quite smooth on both surfaces, and by the ellipsoidal rather small fruit, subtended by a conspicuous terete fruiting perianth and having glossy light coloured scales. It is allied to *C. caesius*, and the fruiting spadices of the two are very much alike, but the fruits of the latter although very similar are considerably smaller than those of the other.

SUPPL. PLATE 60.—Calamus trachycoleus *Becc.* Portion of the sheathed stem and of a leaf; portion of the fruiting spadix. The type specimen in Herb. Beccari.

166. CALAMUS MANAN Miq. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 196.

This large Rotang has been collected according to Ridley in the Malayan Peninsula on Bukit Senaling, near Serembang in Negri Sembilan (*S. Moorhouse*), Native name "Rotang manok telor." I have not seen Ridley's specimens from this locality, and I think that it would be advisable to compare them with those upon which I have founded *C. giganteus*, a species however very closely related to *C. Manan*, and perhaps only a variety of it.

167. CALAMUS GIGANTEUS Becc.

This is probably only a variety of *C. Manan* Miq., from which however it differs in the leaf-sheaths armed with much larger spines, and especially in the form of the spathels which are rather broadly infundibuliform in *C. giganteus*, while they are almost cylindrical in the specimens of *C. Manan* from Sumatra. The fruit of *C. giganteus* seems also smaller than that of *C. Manan.* In any case *C. giganteus* Becc. has no relation to *C. ornatus*, to which it was reduced by Ridley (Mat. Fl. Mal. Penins. ii, 196).

170. CALAMUS PALLIDULUS Becc. Add:—Ridely, Mat. Fl. Mal. Penins. ii, 209.

172. CALAMUS MATTANENSIS Becc.

A specimen with a male spadix of this species, of which the sterile plant only was known has been collected by *J. Hewitt* in Borneo at Kuching in Sarawak, and has enabled me to recognize its great affinity with *C. ferrugineus.* The male spadix in Hewitt's specimen is so much like the female one of *C. ferrugineus*, that I can hardly find different words to describe it; as in the latter it is densely covered in every part with a removable dark rusty-furfuraceous

indumentum, which, after its fall, leaves the surface of the spathes and of the main axis very minutely scabrid: it is 40 cm. long, has 5 small gradually diminishing partial inflorescences, and terminates in a small tail-like appendage; the lowest primary spathe, which sheaths the peduncular part of the spadix, is tubular, 9 cm. long, flattened, very acutely two-edged and slightly prickly on the edges; the upper primary spathes are similar to the lowest, but are slightly enlarged above, somewhat flattened, keeled and slightly prickly on the back, obliquely truncate, entire and densely ciliate-bearded at the mouth and prolonged at one side into a triangular acuminate point; partial inflorescences small, the lowest 6 cm. long, with 6 small, gradually diminishing, arched-scorpoid spikelets on each side, but with an unilateral direction; secondary spathes tubular–infundibuliform, scabridulous-tomentose, truncate and ciliate at the mouth; male spikelets very small, with the flowers alternate, subunilateral, but in 2 series; the lower spikelets (largest) are 8–10 mm. long and have 5–6 flowers in each series; spathels bracteiform, triangular, deflexed, acute, striately-veined; involucre slightly concave or explanate, bilobed and as it were formed by two ovate bracts connate by their bases. *Male flowers* with a broad base, subpyramidate-trigonous, acute, 3 mm. long, 2 mm. broad; the calyx broadly and deeply 3-lobed, the lobes apiculate; the corolla slightly longer than the calyx, its segments ovate, acuminate; stamens with filaments inflected at the apex; anthers sagittate; rudimentary ovary formed by 3 rather conspicuous subulate bodies. The *leaf* which accompanies this male spadix is somewhat smaller than those already described, is 55 cm. long in the pinniferous part, and has 10 inequidistant leaflets on each side, of which the mesials are 20–23 cm. long, 15–18 mm. broad, otherwise it exactly corresponds to the description already given.

To *C. mattanensis* probably belongs the spadix with young fruit which I have attributed to *C. ferrugineus* and represented on the right hand side of plate 225 of this volume, and indeed *C. mattanensis* is very closely related to *C. ferrugineus* especially by the spadix so densely covered with a rusty furfuraceous scurf; but, in *C. ferrugineus* the leaflets are very peculiarly deflexed (see observations to *C. ferrugineus*). *C. mattanensis* with *C. ferrugineus* and *C. retroflexus* form a small subdivision of the group to which *C. palustris* belongs, agreeing in having the spadices of the two sexes very similar and non-cirriferous, and in the leaflets acquiring a yellowish colour in the Herbarium specimens.

Suppl. Plate 61.—Calamus mattanensis *Becc.* Portion of the sheathed stem with an entire leaf and a male spadix from Hewitt's specimen in the Herbarium at Kew.

Calamus mattanensis *var.* Sabut Becc.

Description.—Scandent, very slender. *Sheathed-stem* 8–10 mm. in diameter. *Leaf-sheaths* gibbous-plicate above, very obliquely truncate at the mouth, very thinly rusty-furfuraceous (not scabrid), armed with solitary, scattered, relatively robust, slightly deflexed, rigid spines, 10–12 mm. long, furnished above the rather broad base with a distinct swelling, and showing the outline of their forms stamped on the surface of the leaf-sheaths. *Ocrea* inconspicuous, axillary and very shortly

liguliform. The *leaves* have a rather long petiole, are 35–40 cm. long in the pinniferous part, and terminate in a clawed cirrus 40–50 cm. long; the petiole is 15–16 cm. long, 4–5 mm. broad, glabrous, smooth, flattened, with rather sharp edges, which are armed with a very few, at times rather large, straight or hooked spines: it is flattish on the upper, slightly convex on the under surface; rachis trigonous, armed underneath with solitary claws, which only become first geminate, and then ternate, towards the cirrus, bifaced and with a sharp salient angle on the upper surface; leaflets few (12–16 in all), distinctly aggregated into 3–4 widely spaced groups; the groups 8–15 cm. apart, are formed by two very approximate leaflets on each side of the rachis, the pairs of one side usually opposite to those of the other side, or nearly so; the leaflets are rather firmly papyraceous, concolorous and rather dull on both surfaces, yellowish-green when dry, often marked by a glossy band along one of the margins; they are linear, narrow, almost all of one size, 20–30 cm. long, 10–12 mm. broad, sharply unicostate, more or less acuminate to a bristly tip, and with the base acute and plicate; secondary nerves slender, unequal, all smooth; transverse veinlets numerous, but usually not very sharp; margins acute, very inconspicuously and remotely spinulous or almost smooth. *Male spadix.* . . . . *Female spadix* very similar to that of *C. ferrugineus* and also covered with a rusty-furfuraceous scurf which however does not leave a scabrid surface after it has fallen; the spadix is short (35–40 cm. long), rigid, slender, not flagelliform, has but few (5–6) partial inflorescences, and terminates in a small unarmed tail-like appendage; the peduncular part of the spadix is 8–16 cm. long, strongly flattened, acutely two-edged, unarmed or nearly so; primary spathes tubular, slightly flattened, somewhat enlarged in their upper part, or elongate-infundibuliform, keeled on the back (the keel smooth, or armed with a few very small claws) obliquely truncate, entire, and densely ciliate-bearded at the mouth, prolonged at one side into a triangular, acuminate, erect point; partial inflorescences inserted at the mouth of their own spathes, curved downwards, small; the lower (largest) are about 6 cm. long and have only 2–3 alternate subunilateral spikelets on each side; upper partial inflorescences gradually smaller; secondary spathes infundibuliform, rendered more or less angular by mutual pressure, tomentose, ciliate, barbate at the mouth, and prolonged at one side into a short point; spikelets subscorpioid, inserted just at the mouth of their own spathes: the lower (largest) are 15–20 mm. long, and have 2 series of assurgent approximate female and 2 other series of deciduous, smaller neuter flowers (each series of 3–4 flowers); upper spikelets gradually shorter, and with fewer flowers; spathels short, bracteiform, concave, very broad, acute, deflexed, hairy and ciliate; involucrophorum explanate, bracteiform; involucre explanate, calyculiform, irregularly and acutely 3-toothed; areola of the neuter flower very depressedly lunate. *Female flowers* are secundly arranged (are not flatly bifarious), are about 3 mm. long, ovoid-pyramidate, and have a flat base. *Neuter flowers* similar to the males, but smaller. *Fruiting perianth* shortly yet distinctly pedicelliform; the calyx indurated, ventricose and smooth in its lower part, with a flat base, divided down to the middle into 3 triangular acute lobes; segments of the corolla triangular, acute, about as long as but slightly narrower than the lobes of the calyx. *Fruit* broadly ovoid, or slightly obovoid, very abruptly and distinctly beaked, rounded at the base, 15 mm. long (including beak and perianth), 10 mm. broad; scales arranged

in 15 longitudinal series, slightly squarrose, dull cinnamon-brown, darker towards the point, very slightly grooved along the centre, the point scarious, slightly produced, and, like the margins, finely erose-ciliate. *Seed* ovoid-elliptical, slightly flattened, rounded at both ends, 8 mm. long, 6 mm. broad, 5 mm. thick, coarsely and deeply pitted, radiately rugose around the chalazal fovea which is round and conspicuous in the centre of the raphal side; albumen superficially and coarsely ruminated; embryo lateral, near the base.

HABITAT.—Dutch N. W. Borneo: Gunong Kenepai, Residency of Sambas. (*Hallier* No. 1917 in Buitenzorg Herbarium. Specimen with fruits.) A specimen in Buitenzorg Herbarium (No 16328) with a female spadix in flower, collected by Teijsmann in Borneo, probably in the same locality, also belongs to this variety. Another specimen (No. 16329 in Buitenzorg Herbarium), also collected by Teijsmann, evidently in the same locality, appears to be conspecific with No. 16328. It consists of the upper end of a young plant, has non-cirriferous leaves, and bears slender, rather elongate and clawed leaf-sheath flagella, but no spadices. To this specimen is appended the native name "Rotang Marauw."

OBSERVATIONS.—This variety is the representative form in N. W. Dutch Borneo of the type found in Sarawak, but differs from the latter in the more slender stems, and in the leaves with narrower, more inequidistant, and often geminate leaflets.

SUPPL. PLATE 62.—Calamus mattanensis VAR. Sabut *Becc.* Portion of the sheathed stem; apical portion of a leaf; spadix with fruits and detached seeds (on the right side of the plate) from Hallier's No. 1917. Lower portion of a leaf and an entire female spadix in flower (on the left side), from Teijsmann's No. 16328.

173. CALAMUS OXLEYANUS. Teijsm. & Binn. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 208.

Ridley gives to this plant a height of 20 feet, but to the stem a diameter of only half an inch, which to me seems too little. He describes the leaves as being 4–5 feet long, adding that he has never seen any leaves of 10–11 feet in length, as stated by Griffith; he also states that on Griffith's label, in the Herbarium of the British Museum the vernacular name is written "Rotan Pujare", not "Rotan Pajare." The quite mature fruit is 12 mm. in diameter.

SUPPL. PLATE 63.—Calamus Oxleyanus *Teijsm. & Binn.*—Portion of a male spadix; partial inflorescence with mature fruits. From a specimen collected at Bukis Timah in Singapore, Ridley No. 11473 in Herb. Beccari. (The two figures in the upper part of the plate.)

CALAMUS OXLEYANUS Miq. *var.* OBOVATUS Becc.

DESCRIPTION.—The specimen upon which this variety is founded consists of only one partial inflorescence, about 20 cm. long, bearing 7 spikelets on each side; spathes (secondary) tubular, closely sheathing, obliquely truncate and smooth at the mouth, and prolonged at one side into a short, triangular, acute point, narrowing below and passing into a very short (3-4 mm. long) axial part; this on the axia

side is flat with acute margins but externally is convex, and armed with very small claws; otherwise these spathes are unarmed, and finely striately veined; spikelets spreading, inserted above the mouth of their respective spathes, rather stiff; the lower and largest 6 cm. long, with about 15 flowers on each side; the others gradually smaller and with fewer flowers; the spathels suddenly broaden from a terete base to an asymmetrically infundibuliform limb, produced at one side into a triangular spreading or deflexed point; involucrophorum sessile, shallowly cupular, laterally adnate to the base of the spathel above its own; involucre shallowly cupular, entire, moulded on the involucrophorum and at a level with it; areola of the neuter flower conspicuous, lunate, sharply defined. The *fruiting perianth* has the calyx callous at its base and very briefly pedicelliform, split into 3 broad lobes; the corolla is slightly longer than the calyx; its segments are ovate acute. The *fruit* is obovoid, narrows distinctly to the base, is rounded above, and surmounted suddenly by a rather conspicuous mucro about 2 mm. long: including the perianth and mucro the whole fruit is 17 mm. long and 11 mm. broad; scales arranged in 12 longitudinal series, each series composed of about 6 well conformed scales: they are regularly rhomboidal in shape, about as wide as long, yellowish brown, neatly edged all round with a narrow uniform black band, have the point not produced but obtuse and the margins not or only very inconspicuously erosulate. *Seed* globular, about 7 mm. in diameter, enveloped in a rather thick integument, otherwise deeply and coarsely pitted or alveolate; albumen non-ruminate, the integument being easily removed from the pits; embryo (as in the type) in the centre of the face opposite to the raphe.

HABITAT.—The type specimen in the Herbarium at Buitenzorg is attached to the same sheet as a portion of a spadix of a *Daemonorops periacanthus* Miq., and bears only a label in the handwriting of Teijsman, which states: "Rotang roendang nioer" Soengei liat (Banka). Certainly the locality of Banka is correct, as Miquel mentions that island for the habitat of *C. Oxleyanus*, but it remains uncertain to which of the two specimens must be applied the vernacular name adduced.

OBSERVATIONS.—It differs from the typical *C. Oxleyanus*, growing in Singapore, in the fruit being obovate (not spherical) and having more scales, and in the spathes of the partial inflorescences having a prickly base whereas in the type these spathes are smooth.

SUPPL. PLATE 63.—Calamus Oxleyanus VAR. obovatus *Becc.* Partial inflorescence of a fruiting spadix. The entire type specimens in the Buitenzorg Herbarium. (The figure in the lower part of the plate.)

174. CALAMUS MICROSPHAERION Becc. Add:—Becc. in Philip. Journ. Sc. iv, (1909) 627.

I consider as belonging to this species a sterile specimen collected by *W. J. Hutchinson* in Mindanao, Moro Province (No. 4818 Herb. Forestry Bureau, Manila).

176. CALAMUS UNIFARIUS H. Wendl.

Add to the localities: Java, Simpolan [700 m.] Residency of Besouki, *Koorders* No. 21689 β and No. 28553 β in Buitenzorg Herbarium.

181. Calamus Vidalianus Becc. Add:—Becc. in Philip. Journ. iv, (1909), 634.

Add to the localities:—Montalban, Province of Rizal, Luzon (*Loher*, March 1906, No. 7087 in the Herbarium at Kew: specimen with female spadix in flower). Guinayangan, Province of Tayabas, Luzon, *M. Ramos*, No. 13214, in Herb. Manila and in the Province of Nueva Ecija, *R. J. Alvarez*, No. 22162, in Herb. Manila, Both numbers have male spadices.

In Loher's female specimen the *sheathed stem* is 2 cm. in diameter; the leaf-sheaths are greenish or purplish-greenish, gibbous above, and feebly armed with very small, straight, broad-based spines 2–3 mm. long; the mouth is truncate and fringed with scales and a few spinules. One *leaf* is 1·6 m. long in the pinniferous part, and terminates in a rather long, robust and strongly clawed cirrus; the petiole is quite obsolete. The *leaflets* are about 30 on each side, rather approximate and equidistant in the lower part of the rachis, more distant and somewhat inequidistant above; the mesials are 30–32 cm. long and 20–25 mm. broad and are usually furnished above, near the base of the mid-costa with 1–2 spinules, which are more robust than some which stand higher up; one nerve on each side of the mid-costa is also more or less spinulous, but occasionally a single nerve on one side only is so; underneath all nerves are smooth; the rachis on the upper surface of its lower portion is armed with unequal erect spines, which disappear higher up, where the rachis is bifaced, with the salient angle very obtuse; underneath, the rachis is smooth in its basal part, but towards its upper end is armed with claws, which are at first single, then geminate and finally in half-whorls. The *female spadix* is erect, diffuse, 90 cm. long, has only 4–5 partial inflorescences on each side, and terminates in a short tail-like prickly appendage; the lowest spathe is flattened, two-edged, 12 cm. long; all the other primary and secondary spathes are fringed at the mouth with small paleolae; the lower partial inflorescences are 30–35 cm. long, with 7–8 spikletes on each side: the upper are shorter, and have fewer spikelets; the lower spikelets are 5-6 cm. long, and have 10–12 flowers on each side: the upper are shorter, and bear fewer flowers. The spikelets in Loher's specimen are therefore somewhat more slender, and bear a few more flowers than those of Vidal's No. 938, but are otherwise identical with the latter. The male specimen No. 13214 of the Manila Herbarium has the sheathed stem 18 mm. in diameter. The *leaf-sheaths* are armed with spines longer than those of Loher's No. 7087; the spines are light coloured, needle-like: the largest are 10–12 mm. long, and leave a very distinct impression of their shapes on the surface of the sheath, which in the interstices is greyish-pulverulent, and sprinkled in addition with minute, rusty-coloured dots. The *leaves* are as already described, but in their upper parts the leaflets are very inequidistant, and frequently approximate in pairs on each side of the rachis. The *male spadix* is very similar to the female, erect, rigid, with 4–5 spreading partial inflorescences or spikelet-bearing branches on each side; the lowest spathe is strongly flattened, and acutely two-edged; the lower branches are 15–20 cm. long, and carry 7–8 spreading spikelets on each side; upper branches gradually shorter and with fewer spikelets; finally the uppermost branches are reduced to simple spikelets, but longer, and with more flowers than the others; the spikelets are flattened and pectinate; the largest, those of the lower part of the

branches, are 3–3·5 cm. long, and have 10–11 very approximate or contiguous flowers on each side; the uppermost spikelets are shorter and have 5–6 flowers only on each side; spathels very approximate, concave, bracteiform, horizontal or deflexed; involucre cupular, immersed within its own spathel. *Male flowers* 5 mm. long, 2 mm. broad; the calyx shortly tubular with 3 deltoid acute teeth; the corolla twice as long as the calyx, very obsoletely trigonous, subapiculate, the segments smooth outside.

SUPPL. PLATE 64.—Calamus Vidalianus *Becc.* Portion of the sheathed stem with an entire male spadix; terminal part of a leaf. From No. 13214 Herb. Manila in Herb. Beccari.

183. CALAMUS DIDYMOCARPUS Warb.

Collected again by *Koorders* in Celebes, in the Province of Minahassa (No. 18392 β in the Buitenzorg Herbarium). The specimen is accompanied by a portion of its leaf-sheath, a part which was wanting in the type specimen, and which allows me to complete the description already given of that species. Accordingly *C. didymocarpus* proves to be a robust plant with a sheathed stem about as thick as the wrist. The leaf-sheath is thick, woody, strongly armed with isolated but approximate spines, horizontal, or slightly reversed, of the same uniform light colour as the entire surface of the sheath; the spines are laminar, very rigid, the largest being 2–5 cm. long, 8 mm. broad at the base, and more or less undulate; mixed with these, large spines are others, smaller, but of the same type.

185. CALAMUS SIPHONOSPATHUS Mart.

I have received numerous specimens of this *Calamus*, which is widely diffused in the Philippines, especially in Luzon, and I find that scarcely two specimens are perfectly alike, unless they come from the same locality. They vary much in general size, in spinescence, in the breadth and hairiness of the leaflets, in the spinescence and indumentum of the spathes, and in the numbers of the series of the fruit-scales. Some specimens also are scarcely distinguishable from the allied species *C. microcarpus* and *C. dimorphacanthus*, and perhaps all three may be considered as one of those species that I call "synspecies" the members of which represent second degree species.

CALAMUS SIPHONOSPATHUS var. BATANENSIS. Becc. in Philipp. Journ Sc. iii Botany (1908), 342.

DESCRIPTION.—*Sheathed stem* 4–5 cm. in diameter. *Leaf-sheaths* armed with scattered or subseriate, spreading, light-coloured, feeble, very slender spiculae, 15–20 mm. long or less. *Leaves* 1·6 m. long in the pinniferous part (in one specimen); petiole short and rather robust, flattish and sprinkled with small prickles above, convex and smooth underneath. *Leaflets* numerous, equidistant, very closely set, with 3 or occasionally 5 bristly nerves above, underneath usually smooth or with the mid-costa alone sparingly bristly. *Female spadix* rigid, about 65 cm. long (in one specimen); spathes smooth, loosely sheathing, slightly inflated; partial inflorescences small, the lowest and largest 7–8 cm. long with only 3–5 spikelets on each side, of which

the lower ones are branched. *Fruit* narrowly ellipsoidal, conically beaked, 10–11 mm. long (including the perianth), 5 mm. broad; scales in 14–15 longitudinal series, glossy, straw-yellowish, faintly grooved along the centre, the point triangular, slightly produced, erosely toothed, not very appressed or subsquarrose.

HABITAT.—The Philippines: Batanes, Batan Island at St. Domingo de Basco. Collected by *E. Fénix* in June 1907, with immature fruit (No. 3611 in Herb. Manila).

OBSERVATIONS.—It differs from the type especially in its narrower and less inflated spathes, in the small partial inflorescences, and in the more elongate ellipsoid fruit.

186. CALAMUS MICROCARPUS Becc. Add:—Becc. in Phipp. Journ. Science, iv, (1909), 627 and vi, (1911), 230.

This very variable species is a very near ally of *C. siphonospathus*, from which however, it seems to me always distinguishable by the fruit, which in *C. microcarpus* is covered with scales very deeply grooved along the centre and gibbous on the point, which is very appressed to the following scales, while in *C. siphonospathus* the scales are subsquarrose and slightly grooved. From the flowers alone it is difficult to distinguish the two species from one another. The fruit of *C. microcarpus* varies somewhat in size, probably also, to a certain extent, on account of its degree of maturity. The disposition of the leaflets is also very variable; they are usually regularly set in the lower part of the leaf, and more or less distinctly grouped towards the end.

To the localities are to be added the following: Mount Alban, Province of Rizal, Luzon (*Loher* in Kew Herbarium.); Mount Maquiling, Province of Laguna, Luzon (*F. Tamesis* No. 13305 Herb. Forestry Bureau, Manila: this specimen bears thoroughly mature fruits, ovoid, 9–11 mm. long, 8 mm. broad; the seed is ovoid, 7–8 mm. long, 6 mm. broad and 5 mm. thick, being slightly flattened). Luzon, Province of Tayabas (*Foxworthy* No. 12326 in Manila Herbarium: specimen with ovoid-elliptical fruit, 12 mm. long, 7 mm. broad; the seed is also proportionately elongate); Mindanao, Camp Keithley, Lake Lanao (*Mrs. Mary Strong Clemens*, October 1907, no number in the Manila Herbarium: this specimen is very similar to the type specimens of Vidal; the fruits are broadly ovoid or subglobular-ovoid, 10 mm. long, not including the pedicelliform perianth; the seed is globular or slightly longer than broad, 6 mm. long, and at times very slightly flattened); Mindanao at Todaya on Mount Apo (*Elmer* No. 11676 in Herb. Beccari: specimen in fruit very similar to the preceding, vern. name "Pareti": apparently it is the same as another specimen with female flowers, collected in the same locality with the No. 11652 and bearing the native name "Obanoban"); Island of Polillo (*Robinson* No. 9131 Herb. Manila vern. name "Bungang sipay"); also *McGregor* (No. 10465 Herb. Manila: in this specimen the fruits are quite mature: they are ovoid, 11 mm. long, not including the perianth, 8 mm. broad: seed ovoid, 7·5 mm. long, 6 mm. broad, 5 mm. thick, being slightly flattened).

186*a*. CALAMUS ALCONENSIS Becc. in Philip. Journ. Sc. iv, (1909), 633.

DESCRIPTION.—Scandent, of moderate size. *Leaf-sheaths* very densely armed with very unequal, laminar, more or less closely seriate, confluent spines. *Ocrea* rigid, 5–6

cm. long, entirely covered with unequally long, very rigid, needle-like spiculae. *Leaves* with the petiole armed with the same kind of unequal spines as in *C. dimorphacanthus*, at times 7–8 cm long; the pinniferous part apparently about 1 m. in length, terminating in a very robust cirrus, armed with very strong claws in half-whorls. *Leaflets* numerous, equidistant, ensiform, or very narrowly lanceolate, 20–25 cm. long, 13–15 mm. broad, quite smooth underneath, sprinkled above on the mid-costa and on one nerve on each side of it with not very rigid bristles; margins rather closely and appressedly spinulous. *Fruiting spadix* about 30 cm. long, with smooth spathes and very few, small, slightly branched partial inflorescences, of which the lowest are only 5 cm. in length and have very few spikelets. *Fruit* ovoid or subobovoid, obtusely beaked, 17 mm. long, including the perianth, 12 mm. broad; scales in 12 longitudinal series, polished, of a dirty straw colour, with a narrow paler scarious margin, the point blunt and with a blackish spot, deeply furrowed along the centre quite to the point, and almost bigibbose. *Seed* ovoid, 10·5 mm. long, 7 mm. wide, broadly pitted, irregularly and rather deeply furrowed on the raphal side, and without a chalazal fovea.

HABITAT.—On Mount Alcon in Mindoro. Collected by *M. L. Merritt* at about 1,500 m. elevation in June 1906 (No. 4399 in Herb. Forestry Bureau, Manila).

OBSERVATIONS.—I have seen of this plant only a very incomplete specimen of the leaf-sheaths and leaves, an entire spadix, and a few fruits; the latter were detached from the spadix, though to all appearance they really belonged to it. In the vegetative organs *C. alconensis* does not apparently differ from some forms of *C. dimorphacanthus*, but the fruit is of a different type and more resembles that of *C. microcarpus*.

SUPPL. PLATE 65.—Calamus alconensis *Becc.* Portion of a leaf-sheath with the lower part of a leaf bearing the leaflets of one side only; upper end of a leaf; fruiting spadix nearly entire; one seed. From the type specimen No. 4399 in the Herbarium at Manila.

187. CALAMUS DIMORPHACANTHUS Becc. Add:—Becc. in Philipp. Journ. Science, iv, (1909), 631.

Add to the localities:—Mount Santo Tomas, Province of Benguet, Luzon (*Elmer* No. 6238, Herb. Manila).

This is another polymorphic species, allied to *C. siphonospathus* and *C. microcarpus*, distinguishable from both, in addition to the already adduced characters (p. 480 of this volume) by the fruiting perianth, which in *C. dimorphacanthus* although pedicelliform, is more or less companulate, while in the two other allied species the pedicel is cylindrical, and formed by the hardened calyx only. In the typical form, as in the specimen mentioned above (Elmer No. 6238), and in var. *zambalensis*, the leaflets are bristly on the upper surface on the mid-costa only, while in var. *montalbanicus* the bristles are on 3 nerves, as in *C. siphonospathus* and *C. microcarpus*.

CALAMUS DIMORPHACANTHUS var. MONTALBANICUS Becc. in Philipp. Journ. Science, iv, (1909), 631.

DESCRIPTION.—The specimen upon which I have established this variety is remarkable for the extraordinary spinescence of the leaf-sheaths, and especially of the ocrea, which, moreover, is extraordinarily developed. *Sheathed-stem* 3 cm. in diameter. *Leaf-sheaths* densely armed with laminar, flexible, schistaceous or almost black, unequal spines, the largest being 20–25 mm. long. *Ocrea* 15 cm. long in one specimen, papyraceous and very rigid, very densely beset with very unequal, horizontal and often subseriate or confluent spines, otherwise similar to those occurring on the leaf-sheaths. *Leaves* 1·2 m. long in the pinniferous part, and terminating in a robust and strongly clawed cirrus; leaflets, linear, very numerous and closely set, equidistant, smooth underneath, and furnished above on the mid-costa and on one nerve on each side of it with a few, but relatively robust, subspiny bristles; the margins are rather closely and appressedly spinulous; the petiole, which is 15 cm. long, and the rachis, are both strongly armed above with unequal spines; the mesial leaflets are 18–20 mm. long and 8–10 mm. broad. *Male spadix* about 40 cm. in length, narrowing gradually to a tail-like tip with 7–8 tubular, gradually diminishing, briefly imbricate, primary spathes; male partial inflorescences short and dense.

HABITAT.—The type specimen of this variety (a male plant) is in the Herbarium at Kew and was collected by *A. Loher* in May 1905, on the summit of Mount Batay at 1,380 m. elevation, in Montalban, Province of Rizal, Luzon (No. 7085 Herb. Kew).

OBSERVATIONS.—This variety differs from the type in its leaf-sheaths being very densely spinous, by its large, very rigid and also densely spinous ligule, and by its very narrow 3-nerved leaflets carrying bristles on the upper surface of all three nerves. In the type the ligule is membranous, brittle, and much less spinous, and the leaflets are bristly only on the mid-costa above, and the hairs on the margins are more spreading.

SUPPL. PLATE 66.—Calamus dimorphacanthus VAR. montalbanicus *Becc.* The upper end of a plant with male spadices; intermediate portion of a leaf, upper surface. From the type specimen Loher No. 7085 in the Herbarium at Kew.

CALAMUS DIMORPHACANTHUS var. ZAMBALENSIS Becc. in Philipp. Journ. Science, iv, (1909), 632.

DESCRIPTION.—A more robust plant than the type. *Sheathed stem* 4 cm. in diameter and perhaps at times more. Naked canes 2·5 cm. in diameter with a light straw-coloured, very polished surface. *Leaf-sheaths* very densely spinous as in the other forms. *Ocrea* not so long as in the type, densely covered with spiculae. *Leaves* have the petiole robust and short, very densely spinous; the leaflets are very numerous, very closely set, rigid, or papery-subcoriaceous, narrowly lanceolate: the mesials 20 cm. long or thereabouts, and 15–20 mm. broad, smooth beneath, and furnished above, on the mid-costa, with rigid, subspiny bristles; the side nerves are smooth; the margins are conspicuously ciliated with spreading spinules; the cirrus is, as is usual in this species, robust and armed with half-whorls of strong and tumescent claws. *Fruiting spadix* 55 cm. long in one specimen; primary spathes rather densely spinulous; partial inflorescences short, having few branches and these with few

spikelets, which are rigid and thickish; spathels and involucrophorum as in the other forms; involucre distinctly discoid–orbicular, flat or slightly convex. *Fruit* larger than in type, globose-ovoid, 13 mm. long, about 10 mm. broad, borne on a short but distinctly pedicelliform cylindraceous fruiting perianth; scales shining, arranged in 15 longitudinal series, lightly furrowed along the middle, brown with a darker uniform margin all round, the point blunt.

HABITAT.—Collected by *H. M. Curran* and *M. L. Merritt* on an exposed mountain top in Elfinwoods at Zambales, Luzon, in 1907. Very common and the only *Calamus* found there, according to the collectors.

OBSERVATIONS.—It differs from the type and also from the var. *montalbanicus* in its more robust stem and in its very rigid leaflets, which bear subspiny bristles on the mid-costa above and have conspicuous spreading spinules on the margins. The fruit is larger, more distinctly pedicellate, and with more distinctly furrowed scales than in type. Perhaps this should be regarded rather as a subspecies of *C. dimorphacanthus*, than as a mere variety of it.

187*a*. CALAMUS SCHLECHTERIANUS Becc. n. sp.

DESCRIPTION.—Apparently scandent. *Sheathed stem* about 2 cm. in diameter. *Leaf-sheaths* gibbous above, very densely hispid or closely beset with elastic, coarse, subspiny bristles from 5 to 20 mm. long, spreading or ascendent, polished and blackish but often discoloured; the gibbosity up to the base of the petiole is smooth; the ligule is about 15 mm. long and very densely hispid. *Leaves* large and elongate, almost certainly cirriferous, but the upper end is wanting in the portions of the one leaf seen by me; petiole 13 cm. long, about 1 cm. broad, convex and smooth below, concave above, prickly on the edges; the rachis in its lower part is deeply grooved at the sides, where the leaflets are inserted and is armed underneath with rather robust, scattered, brownish claws; higher up the rachis has on the upper surface an acute salient angle and flat side faces; petiole and rachis are very thinly and partially rusty-furfuraceous. *Leaflets* numerous, equidistant, about 2 cm. apart on each side of the rachis, thinly but rather firmly papyraceous, almost equally green on both surfaces, linear-lanceolate; they narrow a little near the base, where the margins are suddenly reduplicate, and are gradually acuminate above to a fine capillary tip; they are 3-costulate, and have on the upper surface the side-costae more furnished with bristles than the mid-costa; on the lower surface the mid-costa alone is more or less bristly spinulous; transverse veinlets numerous and very distinct; margins distinctly ciliate: the cilia spinuliform in the lower part, longer, more spreading, more approximate and more hair-like towards the apex: frequently and especially towards the apex the marginal hairs are accompanied at their base by a spinule; the intermediate leaflets are about 30 cm. long and 15–16 mm. broad: the lowest are somewhat shorter and narrower. *Male spadix* non-cirriferous, much shorter than the leaves, narrowly panicled, subcupressiform, composed of 5–6 gradually diminishing partial inflorescences issuing from subinflated, approximate spathes, and terminating in a narrow tail-like unarmed appendage, which is formed by very reduced, tubular, narrow, closely sheathing spathes; the primary spathes are thinly coriaceous, tubular and narrow in their lower part, but broaden and become

somewhat inflated above in the upper third part or thereabouts; they expand into an earlike limb, and terminate in a broadly triangular or acute or bluntish point, more or less fringed with chaffy scales on the edges; the spathes are thinly covered externally, especially above, with a grayish furfuraceous tomentum and in addition are very minutely prickly on the back towards the apex; the lowest spathe is about 18 cm. long and 2·5 cm. broad, the others are gradually smaller; the partial inflorescences are inserted inside the mouths of their respective spathes: they form a panicle ovoid in outline and carry 5–6 spikelets bearing gradually diminishing branches, etc., on each side; secondary spathes tubular, elongate-infundibuliform, loosely sheathing, almost horizontally truncate and ciliate at the mouth, slightly produced at one side into a small point, unarmed and thinly furfuraceous-tomentose externally; the lower of these secondary spathes is rather large, 3–3·5 cm. long, about 8–10 mm. broad at the mouth; the other secondary spathes speedily decrease in length and width; the lowest spikelet-bearing branchlets are 7–8 cm. long and carry 5–6 speedily decreasing spikelets on each side; the spikelets are small, have a zig-zag sinuous axis and very few distichous flowers (4–5) only on the lowest and largest; spathels hairy-furfuraceous, suddenly expanded into a short broadly infundibuliform limb, produced at one side into an acute spreading point; involucre sessile and inserted at the base of the spathel above its own, orbicular, very slightly concave. *Male flowers* lanceolate, acute, 4 mm. long, 1 mm. thick or a little more, subtrigonous, often slightly asymmetrical; the calyx is cyathiform-campanulate, with 3 very broad, triangular, acute teeth; the corolla is about 3 times as long as the calyx, with its divisions pergamentaceous, lanceolate, acuminate, slightly sinuous, and finely-striately veined externally.

HABITAT.—New Guinea: Kaiser Wilhelmsland in the forests on Mount Kani at about 1,000 m. elevation. Collected by *Dr. R. Schlechter*, 10th May 1908 (No. 17689 in the Berlin Herbarium).

OBSERVATIONS.—*C. Schlechterianus* is evidently related to the Philippine species of the *C. siphonospathus* group; at least its male spadix is extremely like both in its dimensions, and in the shape of the inflated spathes to that of the above mentioned species. It is distinguishable by the leaf-sheaths being very densely hispid; by the regularly pinnate cirriferous leaves with a moderately long petiole, prickly on its edges; by the numerous, equidistant, linear-lanceolate leaflets acuminate to a very fine capillary tip, with 3 bristly costae above, and bristly spinulous on the mid-costa alone underneath; by the male spadices forming a narrow elongate-cupressiform panicle with several gradually decreasing branched partial inflorescences and terminating in a tail-like sheathed unarmed appendage; by the tubular somewhat inflated spathes; by the very small, zig-zag, few-flowered spikelets, and by the lanceolate sessile acute male flowers. Of this species Dr. Schlecter has collected also a male spadix not accompanied by leaves, and numbered No. 17639; in this spadix the spathes are almost truncate at their mouths, the spikelets are more slender, and the flowers a little broader, and with the corolla slightly shorter and less acuminate than in the spadix of No. 17689.

SUPPL. PLATE 67.—Calamus Schlechterianus *Becc.* Upper portion of a leaf-sheath with the lower part of a leaf; intermediate portion of a leaf; an entire male spadix. From Schlechter's No. 17689 in the Berlin Herbarium.

188. CALAMUS CONIROSTRIS Becc. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 205.

189. CALAMUS LOBBIANUS Becc. Add:—Ridley, Mat. Fl. Mal. Penins. ii, 204.

Ridley describes this palm as having a "stem short not climbing, 3 to 7 feet long, the rattan ½ inch through, green with short joints;" he adds a few other localities to those given by me and says that it is common in dry woods; that it receives the Malay an name "Rotan Manana," and that it grows also in Borneo, whence I have however seen no specimens.

191*a*. CALAMUS BALANSAEANUS Becc. in Webbia di U. Martelli, iii (1910) 230, 242 and in Bull. Mus. Hist. Nat. Paris, 1911, 13.

DESCRIPTION.—Very slender. *Stems* 1·5 m. high, erect (Balansa), but as the spadices are distinctly cirriferous, probably the plant at times is more or less climbing. *Sheathed stem* about 8 mm. in diameter. *Leaf-sheaths* gibbous above, armed with straight, horizontal, rather slender, scattered spines, which are 10 mm. long at most, frequently much smaller, furfuraceous-fringed on the edges when young. *Leaves* (non-cirriferous) in one specimen 65 cm. long on the whole; petiole plano-convex or slightly concave on the upper surface, armed on the acute edges with acicular, 5–10 mm. long, straight, or at times slightly hooked spines; the dorsum armed along the centre with a few solitary claws; rachis bifaced and smooth on the upper surface, armed throughout below with a few small solitary claws. *Leaflets* rather numerous (about 25 on each side), irregularly approximate into 3–4 groups (with rather short vacant spaces interposed between the groups; in the groups the leaflets are almost equidistant, 10–12 mm. apart, and are spreading at a rather wide angle: they are thinly papyraceous, rigidulous, linear-lanceolate, broadest about their middle, and from thence taper almost equally towards both ends, acute at the base, and very gradually acuminate above to a fine bristly tip; they have 3 very slender spinulous costae on the upper surface: underneath the mid-costa alone is very sparingly bristly or else quite smooth; transverse veinlets very conspicuous on the upper surface, as they are of a lighter colour than the blade, which keeps a bright green tint in the herbarium specimens; margins very minutely spinulous; the intermediate leaflets are 15-17 cm. long., 10–13 mm. broad: the lower are slightly shorter but not narrower, and those of the terminal group are 10–12 cm. long., 8–10 mm. broad; the two of the apex are quite free at the base. *Male spadix* . . . . *Female spadix* elongate, flaccid, flagelliform, very slender, as thick as a pack-thread, it has very few (2–3 or at times more?) distant, spiciform, partial inflorescences, and terminates in a very fine, minutely and irregularly clawed flagellum; the lowest primary spathe is tubular, 14 cm. long., 4 mm. broad, flattened and acutely two-edged, prickly on the edges, otherwise smooth, prolonged beyond the insertion of its own partial inflorescence into a lanceolate acuminate limb; upper primary spathes very elongate, armed with small scattered claws, very narrowly tubular, more or less split above and produced somewhat beyond the insertion of their respective partial inflorescences into an ear-like lanceolate limb; in their lower part, the primary spathes gradually pass into the very slender strongly flattened axial part; the partial inflorescences are 10–12 cm. long, issue from inside their respective spathes, and have a very short pedicellar

part; they are very narrow, strictly and densely spiciform, composed of a few very appressed, small, few-flowered spikelets in their lower part, but from about the middle composed only of at first ternate, then geminate, and finally solitary female flowers; secondary spathes and spathels similar, smooth, infundibuliform, with narrow bases, obliquely truncate at the mouths and produced into a triangular erect, acute, marcescent point; the spikelets are inserted inside their own spathes; the lower and largest spikelets are 15–20 mm. long, and have two series of 5–6 subunilateral, erect, appressed female flowers; involucrophorum and involucre similar, cupular, subcyathiform, truncate, obliquely evolute; the involucre on the side of the neuter flower is almost ear-like; areola of the neuter flower ovate, niche-like, sharply edged. *Fruiting perianth* explanate. *Fruit* globose, shortly beaked, about 1 cm. in diameter; pericarp very thin and brittle; scales broader than long, arranged in 21 longitudinal series, straw-coloured, edged by a narrow, very dark band, very narrowly and faintly grooved along the centre, not produced, bluntish or subacute at the apex, the margins almost entire. *Seed* irregularly globular, 7 mm. in diameter, facetted: the facets slightly concave; chalazal fovea large and rather deep in the centre of the raphal side; albumen equable; embryo basal.

HABITAT.—Tonkin: Than Moi in the shrub. Collected by *Balansa*, 5th March 1886 (No. 517 in Herb. Paris).

OBSERVATIONS.—It is related to *C. Henryanus*, but is distinguishable by the shorter, very simple, distinctly spiciform partial inflorescence; by the areola of the neuter flower devoid of a special support for its flower; and by the leaves, which apparently have smaller leaflets, but those of *C. Henryanus* are very imperfectly known. Like *C. Henryanus* it shows also a certain affinity to *C. leptospadix*.

SUPPL. PLATE 68.—Calamus Balansaeanus *Becc.* Female. The type specimen in the Herbarium at Paris, Balansa No. 517.

The specimen of a *Calamus* collected by *J. Cavalerie* in China at Ly-po, Province Kwei-tschou (Kouy-tcheou) 25°·30 N. Lat., 108° E. Long. Gr., apparently is the male plant of *C. Balansaeanus*. I have seen of it only a spadix, and the apex of a leaf which corresponds in every particular with the corresponding part of the type, only the leaflets are slightly larger. The *spadix* is exactly like that of the female of *C. Balansaeanus*, about 1 m. long, and terminating in a very slender minutely clawed flagellum; it bears 6 small, gradually decreasing, very narrow and strict partial inflorescences, of which the lower ones are composed of very few (2–5 in all) side spikelets, and of one terminal which is considerably larger than the others; the upper inflorescences are reduced to this single elongate spikelet; the secondary spathes are very narrow, angular, closely sheathing, produced above to a triangular acuminate point; the lateral spikelets are 2–2·5 cm. long, flattened and with 5–10 flowers on each side; the terminal spikelet of each inflorescence is 6–7 cm. long, with more or less approximate flowers; spathels very obliquely infundibuliform, covered with small rusty ramentaceous scales, produced at one side to a triangular acuminate and bristly tip; involucre deep, subcalyciform, deeply emarginate and bidentate on the side next to the axis. *Male flowers* 4–5 mm. long, lanceolate-acuminate, obsoletely trigonous; the calyx is scarious-membranaceous and gradually narrows above, has a small opening with 3 very small teeth at its apex, otherwise it is entirely closed; the corolla is

completely enveloped by the calyx, its segments are lanceolate acuminate and as long as the calyx; the stamens have sagittate, lanceolate, acuminate anthers. The structure of these flowers is very peculiar owing to the corolla being entirely enclosed within the calyx, but all those seen by me were not yet open.

SUPPL. PLATE 69.—Calamus Balansaeanus *Becc.* Summit of a leaf, and an entire male spadix. The entire Cavalerie's specimen.

193. CALAMUS FERRUGINEUS Becc.

The type specimen of this species must be considered that of Lobb, represented in plate 225 excluding of the spadix bearing young fruits (on the right-hand side of the same plate) which apparently belongs to *C. mattanensis* Becc. The spadix of *C. ferrugineus* is very similar to that of *C. mattanensis*, but it has the lowest spathe more elongate, less distinctly two-edged, with the edges smooth, and only its dorsal keel on its upper part is prickly.

193a. CALAMUS RETROPHYLLUS Becc. n. sp.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* 8–10 mm. in diameter. *Leaf-sheaths* gibbous, plicate above, very obliquely truncate, entire and bare at the mouths, sprinkled with very minute punctiform hair-like rusty scales, and armed with unequal, straight, spreading, broad-based, light-coloured, short (2–10 mm. long) spines. *Ocrea* liguliform, ciliate, deciduous. *Leaves* about 40 cm. long in the pinniferous part, terminating in a long, minutely clawed cirrus, and without a petiole, the lowest leaflets being attached just at the mouths of the sheaths; rachis in its lower portion thickish, obsoletely angular, higher up acutely 3-gonous, armed on the lower surface along the centre at first with relatively robust and solitary, but higher up with 3-nate claws; the salient angle on the upper surface very sharp and smooth; leaflets 22–28 in all, very inequidistant but not grouped, 1·5 cm. apart in the lower part of the rachis, more distant towards the end; 5—6 leaflets on each side, amongst those nearer to the base are strongly deflexed, frequently opposite, and furnished above with a conspicuous axillary callus, which retains those leaflets in the said unusual position; all are unicostate, firmly papyraceous, dull, concolorous and quite devoid of bristles or spinules on both surfaces, but on the lower are covered with innumerable, very minute, light-coloured papillae (visible only under a strong lens of which a few are to be found also in the upper surface; the mid-costa is acute and prominent above, and is accompanied beneath, on each side, by 2–3 rather distinct secondary nerves; transverse veinlets conspicuous, translucent; margins acute and quite smooth; the form and size of the leaflets is somewhat variable; the mesial leaflets are linear, 20–26 cm. long and only 5-6 mm. broad in some specimens, and at times narrowly lanceolate, 15–18 cm. long and 10–15 mm. broad, always gradually and long acuminate; the upper leaflets are narrower and shorter: those near the base, which are deflexed, are shorter but broader than the others (10–12 cm. long, 11–12 mm. broad) and frequently are less gradually or also rather suddenly acuminate. *Male spadix* more or less furfuraceous throughout with rusty, not very adherent, scales; about 50 cm. long, nodding, ending in a small tail-like appendage and divided into 6–7 alternate, gradually decreasing, simple, slender partial inflorescences; lowest primary spathes slightly larger than the upper,

otherwise similar, closely sheathing, slightly enlarged above, more or less prickly on the back, densely ciliate-bearded at the mouths; the lower, and larger, partial inflorescences 10–12 cm. long, bearing 8–10 small arched subscorpioid spikelets on each side; secondary spathes tubular-infundibuliform, rusty-furfuraceous, densely ciliate at the mouths; male spikelets very small: the lower and largest 10–12 mm. long and with 7–9 very approximate flowers on each side; spathels bracteiform, triangular, deflexed, subtending the base of the flowers; involucre slightly concave, strongly striately veined, deeply bilobed and as if formed by two ovate bracts united by their bases. *Male flowers.* . . . . . .

HABITAT.—Dutch N. W. Borneo. First collected (sterile) by *Teijsmann*, probably in the Residency of Pontianak, No. 16334 in Buitenzorg Herbarium; native name "Rotang lilung." Found again with male spadices from which all the flowers had fallen, by *Hallier* at Liang-gagang, No. 2596 in Buitenzorg Herbarium.

OBSERVATIONS.—It seems related to *C. mattanensis* from which it differs in the leaves being almost without a petiole, and with the leaflets of the lower part of the rachis curiously deflexed, as occurs also in *C. ferrugineus*, which *C. retrophyllus* resembles; but perhaps its nearest ally is *C. mucronatus*, from which it however differs by its characteristically deflexed lower leaves.

SUPPL. PLATE 70.—Calamus retrophyllus *Becc.* Portion of the specimen of an entire male spadix and leaves. From Hallier's No. 2596 in Buitenzorg Herbarium.

199. CALAMUS DISCOLOR Mart. Add :—Becc. in Elmer's Leaflets Philip. Bot. i, (1909) 449.

C. Lindenii Rodigas, Ridley in Journ. Str. Branch Roy. As. Soc. No. 44, (1905) 200.

DESCRIPTION.—Scandent, rather slender. Naked *stem* about 13 mm. in diameter. *Leaf-sheaths* densely set with thin, very slender, brown spines. *Leaf-sheath* flagella very long and slender (one is 3·5 m. long), very powerfully armed at the almost regular distance of 15–20 mm. with half- or three-quarter whorls of very acuminate and sharp claws which have blackish points, and light-coloured, glabrous bases, while the axial part of the flagellum is finely rusty-furfuraceous and its upper capillary end is very minutely clawed; the lower spathes of the flagella are armed with claws, and in their upper part are slashed or disintegrated into fine fibres. *Leaves* (non-cirriferous) apparently about 1–1·2 m. long in the pinniferous part; petiole rather elongate; rachis covered with a conspicuous, adherent, rusty-furfuraceous indumentum: it is convex below where armed powerfully and closely with ternate claws which become solitary towards the end; on the upper surface the rachis is bifaced with a very acute salient angle. *Leaflets* numerous, very regularly and closely set at a very wide angle (15–20 mm. apart but at times only 10 mm. on each side of the rachis): they are papyraceous, rather firm, green and dull above, covered underneath with a thin, chalky-white coating, very narrowly lanceolate, long-acuminate above to a fine bristly tip, narrowing very briefly in their lower part and with the margins very suddenly drawn together at the base: they are subtricostulate, or have the mid-costa prominent and sharp,

and the side costae very slender; on the upper surface all 3 costae, but on the lower only the midcosta carry several long fulvous bristles; secondary nerves few and slightly more slender than the side costae; the tertiary nerves show both surfaces finely striate; transverse veinlets much interrupted; margins ciliate with rather conspicuous, blackish, spreading, and rigid hairs; the intermediate leaflets are 30–35 cm. long, 20–22 mm. broad: those near the upper end very speedily decrease in size, the two terminal being the smallest, 15 cm. long, 10–12 mm. broad, and quite free at the base. *Male spadix* not seen by me, but probably not differing from that of the var. *negro sensis*. *Female spadix* elongate, more or less flagelliferous at its upper end and bearing a few partial inflorescences; its axial part is terete, about 1 cm. in diameter at its base; primary spathes as long as or longer than their respective partial inflorescences, strongly striate longitudinally, unarmed, thickish and hard in their lower living part, and neatly separated by a sharp line from the elongate, dry, slightly furfuraceous and marcescent upper portion, which moreover is more or less slashed or split longitudinally into several unequal strips and soft filaments; partial inflorescences inserted inside their respective spathes, densely racemose, arched, twice branched in their lower parts, and having simple approximate spikelets above; secondary spathes marcescent and slashed in their upper part, rusty-furfuraceous; spikelets spirally (not bifariously) inserted round the axial parts; the lower spikelets (the largest) 3–4 cm. long, have the axis slender and furfuraceous; usually the spikelets carry the flowers spirally without much regularity all round, but at times are also partially bifarious; involucrophorum subdiscoid, laterally attached to the axis; involucre similar to, and as large as, the involucrophorum, discoid, suborbicular; areola of the neuter flower punctiform. *Fruiting perianth* pedicelliform; the calyx flat and callous at its base; the segments of the corolla ovate, subacute, slightly longer than the broadly triangular marcescent teeth of the calyx. *Fruit* very small, ellipsoid-oblong (7 mm. long., 2 mm broad, when not quite mature), crowned with relatively conspicuous spreading stigmas; scales very small, arranged in 21 longitudinal series, flattish, squarrose, not grooved along the centre, light coloured with a scarious white finely erosely toothed margin; the tip rounded with a reddish intramarginal lunate line. *Seed* not seen mature.

HABITAT.—The Philippines. Originally described by Martius from sterile specimens only; afterwards introduced in cultivation (under the name of *C. Lindenii*), and only more recently collected with very young fruits in its native country by *Elmer*, at Lucban in Luzon, Province of Tayabas (No. 9299 in Herb. Beccari). Specimens of very young entire plants collected by *Ramos* (No. 12035 Herb. Manila) at San Antonio, Province of Laguna, Luzon, apparently are of *C. discolor*.

SUPPL. PLATE 71.—Calamus discolor *Mart.* Terminal portion of a leaf; spadix with young (non-fertilized?) fruits. From a plant cultivated in the Botanical Garden of Singapore and forwarded to me by Mr. Ridley under the name of *C. Lindenii*.

CALAMUS DISCOLOR Mart. var. NEGROSENSIS Becc. in Philip. Journ. Science, iv, (1909), 635.

DESCRIPTION.—High scandent. *Leaf-rachis* rusty-furfuraceous; leaflets very numerous, equidistant, very narrowly linear-lanceolate, broadest about their middle,

green above, and white beneath, exactly as in the type, from which, however, they differ in being smaller and in having a few bristles above on the mid-costa only, while the under surface is sprinkled all over, except at the base, with scattered, small, spadiceous, subspiny bristles; the largest leaflets, the mesials, are 20–22 mm. long, and 9–10 mm. broad. *Male spadix* apparently rather large, with several partial inflorescences each of which forms a rather dense panicle, 20–30 cm. long, twice-branched and covered with a soft detachable whitish scurf on the spathes: secondary spathes infundibuliform, rather loosely sheathing; branches 10–12 cm. long or at times less, bearing a few gradually decreasing branchlets, which carry distichally 4–6 spikelets on each side; the spikelets are inserted at the mouths of their respective spathes: they are 2–3 cm. long, flattened, comb-like, with perfectly bifarious, horizontal, contiguous flowers; the axis of the spikelets is slender, not brittle; spathels very short, concave, apiculate at one side, very strongly and finely striately veined; involucre cupular, obliquely truncate, 2-dentate on the axial side. *Flowers* small, ovoid; the calyx sharply and finely striately veined like the spathels, teeth 3 acute.

HABITAT.—The Philippines: at Cadis in Western Negros. Collected by *F. Danao* at about 50 m. above the sea No. 12432, Herb. Forestry Bureau, Manila). The vernacular name is "Limoran."

OBSERVATIONS.—The specimen upon which this variety is established consists only of the upper part of a leaf and of a few partial inflorescences of a male spadix. There is not however all the requisite evidence to prove that this specimen really represents the male plant of *C. discolor*, as the male spadix of the type, and the female one of this supposed variety are unknown; the leaf however of the plant from Negros Island, with its leaflets white beneath, though endowed with some peculiarities of its own, leaves little doubt as to its specific identity with or at least of its great affinity to *C. discolor*.

SUPPL. PLATE 72.—Calamus discolor VAR. negrosensis *Becc.* Portion of a leaf; two partial inflorescences of a male spadix. From No. 12432 in the Herbarium at Manila.

199*a*. CALAMUS BICOLOR Becc. n. sp.

DESCRIPTION.—High scandent, of middling size. Naked *stem* 15–20 mm. in diameter. *Sheathed stem* 4 cm. in diameter. *Leaf-sheaths* non-flagelliferous, thickish, woody, very densely covered with very slender, almost hair-like, unequal, elastic, brownish spines, 4–5 cm. long or less; near the mouths the spines are even longer and more thread-like. *Leaves* elongate, cirriferous, apparently about 1·5 m. long in the pinniferous part; the petiolar part is 15–25 cm. long, 12–15 mm. broad, somewhat flattened, with the two faces equally convex, and the edges bluntish; the rachis is convex on the upper surface a long way up from the base and has rather broadly yet not deeply channelled sides where the leaflets are inserted; higher up it is bifaced with a prominent and prickly salient angle; petiole and rachis are both more or less thinly and fugaciously furfuraceous and strongly armed above with erect or slightly ascendent, unequal, rigid, very short or at most 8–10 mm. long spines; underneath petiole and rachis are slightly convex and in their lower

portion prickly only near the margins, otherwise they are smooth up to about the middle, and thence irregularly armed with unequal claws. *Cirrus* 1 m. long or thereabout, very powerfully and densely armed with robust, long-pointed, half-whorled claws, and further furnished between the rows of these large claws with several other smaller claws, scattered or more or less confluent; the cirrus has the peculiarity of being furnished up to the apex with several, distant, very rudimentary leaflets, represented by long and very slender filaments, ciliate on the edges. *Leaflets* (numerous, equidistant, 2·5–3·5 cm. apart, conspicuously discolorous, or green above (shiny rich green when fresh–Elmer), and covered with a thin, adherent chalky-white coating beneath; they are papyraceous and rather firm in texture, very narrowly lanceolate, tapering somewhat towards the base, and very gradually long-acuminate to a fine rigid tip which is produced into a capillary apex; the upper surface is smooth or furnished with only a few long straggling bristle. on the mid-costa, and also but more seldom, on one of the secondary nerves, of which there are 3 on each side; tertiary nerves not very prominent; on the lower surface the mid-costa is always (and occasionally one of the side-nerves also) furnished with bristles; transverse veinlets short, and much interrupted; margins rather closely ciliate with rigid, subspiny, ascendent hairs; the intermediate leaflets are 25–35 cm. long and 18-22 mm. broad. *Male spadix* . . . . *Female spadix* rigid, erect, non-flagelliferous; it forms an elongate, cupressiform, acuminate, rather dense panicle, 40–60 cm. long, borne on an as long, or at times even somewhat longer peduncular part (an entire spadix seen by me is on the whole 1·40 cm. long, and the panicle alone about 60 cm.); the peduncular part is very rigid, somewhat flattened, equally convex on both faces and has the edges blunt lower down, and rather sharp above; it is densely covered all round with unequal, horizontal, scattered, rigid, usually short, straight spines; the primary spathes at first entirely envelope the partial inflorescences, then split longitudinally down to their bases and open flat, as in the species of the *C. platyspathus* group and appear broadly linear: finally they are slashed into several strips and fall into decay; the spathes are of a rather soft and thin texture, dull cinnamon-brown, glabrous and striate inside, covered externally with a very fine, soft, furfuraceous, brown indumentum; the lower primary spathes are 30–40 cm. long, 2·5 cm. broad, the others are smaller; the panicle is composed of a few (4–6) gradually decreasing partial inflorescences: its main axis is more or less prickly. The partial inflorescences are erect, dense, twice and in their lower parts even 3 times branched; the largest (lowest 10–15 cm. long, the others gradually smaller, covered more or less permanently in every part with a furfuraceous, tobacco-coloured scurf: they have a very short pedicellar part, conspicuously swollen at its base; all primary and secondary branches, and the spikelets also are conspicuously callous at their axillas; the secondary spathes have a very short, annular, entire limb, slightly apiculate at one side; the largest spikelets (the lower ones) are 4–5 cm. long and have 5–8 alternate flowers on each side; the axis of the spikelets is about 1 mm. thick, and is sinuous between the flowers; the spathels form part of the axis of the spikelets, and have only a very short entire annular limb slightly apiculate at one side; involucre almost laterally adnate at the base of the spathel above its own, irregular, almost explanate and usually bidentate on the posticous side; involucre subdiscoid,

suborbicular or irregular, very shallowly concave; areola of the neuter flower punctiform, more or less swollen or tuberculiform. *Female flowers* small, 3·5 mm. long, elongate-conical from a flattish base, 1·5 mm. broad, acuminate, glabrous; the calyx strongly striately veined and with 3 short acuminate teeth; the segments of the corolla lanceolate-acuminate, slightly longer than the calyx. *Neuter flowers* very similar to the female ones, and about as long as these but much thinner. *Fruiting perianth* pedicelliform. *Fruit* small, ovoid-elliptical or subobovoid, obtusely apiculate, 8 mm. long, 5 mm. broad (when not quite mature); scales arranged in 21 longitudinal lines, glossy, light green all over or with a reddish intramarginal line: they have a narrow, scarious, finely erose margin and are rather deeply grooved along the centre: the apex is slightly produced and bluntish. *Seed* not seen when quite mature.

HABITAT.—The Philippines. *Elmer* has collected in Mindanao, District of Davao, two numbers, showing slight differences among them. That which may be considered as the type, No. 10541, was collected in dense woods in May 1909, at 1300 m. above the sea level, south of the Sibulan river and to it are assigned the native names "Lessee" or rather "Rassee." The other, No. 10618, was collected also in May 1909 at 1800 m. in the forests on Mount Calican and bears the native name "Sambonotan."

OBSERVATIONS.—Owing to its elongate lanceolate leaflets, green above and white underneath, it may at first be mistaken for *C. discolor;* it is, however, quite distinct from that by its non-flagelliferous spadix and quite different spathes. Its affinities, however, seem greater with the species of the group of *C. siphonospathus,* but it is distinguishable also from these by its non-sheathing spathes, spread open after the anthesis, as in the species of the *C. platyspathus* group. Elmer's No. 10618 slightly differs from No. 10541 in the leaflets, which are sometimes bristly on some of the secondary nerves, and in the slightly more rounded fruit with concolorous scales. The leaf-cirrus described above having the very peculiar filiform rudimentary leaflets belongs to No. 10618.

SUPPL. PLATE 73.—Calamus bicolor *Becc.* Portion of the sheathed stem; an entire fruiting spadix; the summit of a female spadix in flower; intermediate portion of a leaf, undersurface. The entire spadix and the portion of the leaf from Elmer No. 10541; the portion of the spadix in flower and the stem from No. 10618. Both specimens in Herb. Beccari.

LATEST ADDITIONS.

159*b*. CALAMUS TAPA Becc. n. sp.

DESCRIPTION.—Scandent and slender. *Sheathed stem* 10–14 mm. in diameter. *Leaf-sheaths* strongly gibbous-plicate above, obliquely truncate at the mouth, thickish, yet of a relatively soft texture, and shrinking longitudinally in drying, dull and glabrous, rather powerfully armed with rather large and robust, scattered, horizontal spines, which have a swollen base more or less concave below; the largest spines are 8–10 mm. long, but several are smaller, and, at times, are reduced to simple non-pungent tubercles. *Ocrea* membranous, short (10-15mm. long), glabrous, axillary,

iguliform, later dry and falling to pieces. *Leaves* rather elongate, apparently about 70 cm. long in the pinniferous part and with very few leaflets; petiole short (3–4 cm. long), quite unarmed, concave on the upper and convex on the lower surface, the edges acute; rachis is slightly bi-convex in its lower portion, has a very obtuse smooth salient angle upwards on the upper surface, is very slightly armed on the back with a very few, very small claws, and terminates in a slender cirrus, which is regularly and not very closely armed with small, half-whorled claws. *Leaflets* very irregularly alternate, only 3–4 in number on each side of the rachis, and very distant one from the other (10–20 cm. apart), papyraceous, rather firm, dull and smooth, on both surfaces, slightly paler underneath, lanceolate, or narrowly lanceolate-elliptical, gradually tapering towards an acute base and briefly acuminate to a bristly tip, plicate-pluricostulate or with 3–5 slender, but very sharp main-costae, which are accompanied by a few other nerves, smaller, but at times about as strong as the principal costae; transverse veinlets numerous, short, very fine, more prominent on the upper than on the lower surface; margins very remotely and inconspicuously spinulous; the intermediate leaflets are 30–35 cm. long, 3-4 cm. broad, the others are somewhat smaller. Other parts unknown.

HABITAT.—Dutch N. W. Borneo: Sungei Kenepai, Residency of Pontianak (*Hallier*, No. 2128 in Buitenzorg Herbarium.) Native name "Rotang Tapa." It is probably one of the good commercial kinds of Rotang.

OBSERVATIONS.—*C. Tapa* is very imperfectly known, as I have seen only incomplete sterile specimens; nevertheless it is a very peculiar species, easily distinguishable among the species of Group XV, by its leaf-sheaths of a soft texture and by the leaves with very few alternate elongate-lanceolate, pluricostulate leaflets. Apparently it is related to *C. caesius* and *C. trachycoleus*.

Teijsmann mentions (Verslag eener botanishe reis naar de West kust van Borneo, 1874-1875) a *Calamus* under the native name "Rotan Tapa," which probably corresponds to that described above.

SUPPL. PLATE 74.—Calamus Tapa *Becc.* The type specimen Hallier's No. 2128 in the Buitenzorg Herbarium.

187*C*. CALAMUS SEMOI Becc. n. sp.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* about 2·5 cm. *Naked canes* 13 mm. in diameter. *Leaf-sheaths* strongly gibbous above, armed irregularly with solitary, elongate-triangular spines, which are 10–18 mm. long, have their bases 5–6 mm. broad and concave underneath, and leave stamped above them a shallow smooth impression of their form, while the entire surface interposed between these impressions is marked by very minute, approximate, sinuous, transverse very finely scabrid-serrulate, superficial ridges. *Leaves* elongate with about 30 leaflets on each side; petiole very short (7–8 cm. long), flattish on the upper and slightly convex on the lower surface, armed more or less on both surfaces and on the margins, with short scattered prickles; the rachis has a line of small solitary claws along the centre of the dorsum, and has a very acute salient angle and flat side faces on the upper surface; cirrus slender, armed

densely with small solitary claws. *Leaflets* equidistant, about 3 cm. apart on each side, papyraceous, rigidulous, almost glossy on both surfaces, slightly paler underneath, ensiform and broadest about their middle whence they taper almost equally towards both ends: they have the base acute, and the apex very finely and minutely bristly: are 3-costulate or else sub-5-costulate; the 3 main costae are very acute and sparingly bristly-spinulous on the upper surface, the other 2 costae, if present, are slender and run very near the margins; underneath the costae are not prominent, and all 5 are spinuliferous; transverse veinlets short, and very fine above, obsolete underneath; margins very minutely spinulous; intermediate leaflets 30–33 cm. long, 14–16 mm. broad; those near the upper end shorter but not narrower, and those of the base, shorter and narrower. *Male spadix* . . . *Female spadix* elongate-flagelliform, simply branched: it has very few (4) distant partial inflorescences, is 1·5 m. long in the floriferous part (in one specimen) and terminates in a long filiform flagellum, which is almost smooth or very feebly armed with a few small, scattered, solitary claws; primary spathes tubular, elongate, very closely sheathing, thinly and partially fugaciously rusty-furfuraceous; the lowest is somewhat flattened, 8–9 mm. broad, has rather acute edges, and is armed with numerous horizontal, short and broad or narrowly triangular, solitary or irregularly confluent, brownish spines, which have a lighter coloured and swollen base; the two following spathes do not bear partial inflorescences in the specimen seen by me, are cylindraceous, truncate at the mouths, and minutely prickly all round; the upper primary spathes are tubular in their lower part, split and spread open upwards into a membranous, brown, dry, marcescent, not quite explanate, linear, usually lacerate limb; this is more or less spinulous externally in its lower part; axial parts of the spadix plano-convex, with very sharp edges, unarmed; the partial inflorescences are simple, elongate, flabby, have their axes slender, terete, smooth, as thick as a packthread, and carry distichally 6–8 spikelets on each side; secondary spathes about 3 cm. long, with a short tubular part which very abruptly spreads out into an ovate or ovate-lanceolate, auriculiform, acute, membranous, brown, dry, marcescent limb; spikelets inserted in the axillas of their respective spathes, and at first entirely enwrapped by these, and always slightly shorter; the spikelets are slightly arched-scorpioids have 4 series of collateral, assurgent, very closely packed flowers: the two central series are of female and the outer ones of neuter flowers: each series contains 10–14 flowers in the larger lower spikelets which are 2–2·5 cm. long: upper spikelets shorter, and with fewer flowers; spathels very approximate, concave, produced at one side into a triangular acute point; involucrophorum shallowly dimidiate-cupular, flat, two-keeled and bidentate on the side next to the axis; involucre irregularly cupular, rather shallow, lunately excavate and produced into two acute teeth on the side of the neuter flower; areola of the neuter flower large and conspicuous, especially in the lower part of the lowest spikelets, lunate, sharply defined, bidentate or bicornute; spathels and involucra of a reddish brown colour, and distinctly striately-veined. *Female flowers* conical-ovoid, 4·5–5 mm. long; the calyx narrows from a broad base towards the mouth, has 3 deltoid acute teeth and is strongly striately veined; the segments of the corolla are lanceolate, acuminate, a little longer than the calyx; ovary globose, style very short, stigmata relatively large and thick, trigonous, spreading.

Neuter flowers about as long as the female, but thinner, and with the corolla about twice as long as the calyx. *Fruit* . . .

HABITAT.—N. W. Borneo, at Quop in Sarawak (*Hewitt* in Kew and Manila Herbaria, from the Sarawak Museum Herbarium). From a note by Hewitt it appears that this Rotang is cultivated by the Dyaks of Quop (who call it "Rotang Semoi") owing probably to the good quality of canes it produces.

OBSERVATIONS.—*C. Semoi* approaches *C. leptospadix* in the very elongate spadix, and in the spathes of the partial inflorescences, which have a very short tubular part, and are abruptly spread out into a broad auriculiform limb; but *C. Semoi* has cirriferous leaves, and must be included in the group XV, where it forms, with a few other allied species, a separate subgroup, characterized by the long flagelliform spadices and by the peculiar auriculiform secondary spathes. *C. Semoi* differs from the allied species, and especially from *C. Ulur*, to which it is closely related, by its equidistant, narrow but distinctly 5-costulate leaflets, but especially by the secondary spathes being only slightly longer than their respective spikelets; with *C. Ulur* it has in common the peculiar structure of the female spikelets, which have the very closely packed flowers arranged in two collateral assurgent series, accompanied by conspicuous neuter flowers which are inserted in a relatively large involucriform niche.

SUPPL. PLATE 75.—Calamus Semoi *Becc.* Portion of a sheathed stem; portion of the female spadix in flower; intermediate portion and upper end of a leaf. From Hewitt's specimen in the Herbarium at Kew.

187*d*. CALAMUS ULUR Becc. n. sp.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* in full-grown plants about 2·5 cm. in diameter. *Leaf-sheaths* strongly gibbous-plicate above, obliquely truncate at the mouths, very thinly covered with small, rusty, appressed, orbicular scales, and armed with very unequal, solitary, laminar, elongate-triangular, very irregularly and often obliquely inserted spines, of which the largest are 1–2 cm. long and have a broad base which is at times 12–15 mm. broad, is more or less extended right and left, and is considerably concave underneath; between the spines the surface of the sheaths is marked by very minute, interrupted, often approximate, scabrid-serrulate or finely spinuliferous, slightly prominent ridges. *Ocrea* short, axillary, liguliform, coarsely ciliate. *Leaves* cirriferous, elongate, with several very inequidistant or irregularly aggregated leaflets on each side; petiole (in leaves of full grown plants) short, 3–4 cm. long, 14–15 mm. broad, plano-convex in cross section, with rather acute, usually smooth edges; the petiole is smooth on the upper and sparsely prickly on its lower surface, where it has also several spinuliferous transverse ridges; a leaf from a young plant of which the sheathed stem is only 15 mm. in diameter has a petiole 25 cm. long, 7 mm. broad, flattish, or slightly concave on its upper surface and convex on its lower; the pinniferous part is 55 cm. long and terminates in a slender cirrus; the rachis is armed along the centre of the dorsum and on the sides with scattered claws, its upper salient angle is smooth; the leaflets of this leaf are 25 in number in all, irregularly

aggregated into a few scattered groups, each group being composed of 2–4 leaflets, approximate (10–15 mm. apart) on each side of the rachis, with long vacant spaces interposed between them; the leaflets are papyraceous, ensiform or very narrowly lanceolate, 3–sub–5 costulate with 2 of the costulae running near the margins; on the upper surface, 3 or at times 4 costulae are bristly; on the lower surface the costulae are all smooth, or only 1–2 have a few spinules; transverse veinlets short, interrupted, conspicuous on both surfaces; margins very minutely spinulous. *Male-spadix* . . . *Female-spadix* very long, slender and flaccid: in one specimen it is 2·5 m. long and does not terminate in a clawed cirrus: it is simply branched and has a very few (4) distant partial inflorescences; primary spathes thinly and partially rusty-furfuraceous, tubular, very elongate, closely fitting, and prickly in their lower parts, but much lacerated and fibrous from the middle upwards; the lowest spathe is rather flattened, two-edged, 10–12 mm. broad, very densely armed with small, deflexed, aggregated spines, which have confluent and swollen tuberculiform bases; the succeeding primary spathes are thinly and partially rusty-furfuraceous, tubular, closely fitting and from about the middle upwards much lacerated and fibrous; lower down they gradually pass into an elongate plano- or concavo-convex, slender, unarmed, very acutely edged axial part; partial inflorescences simple, elongate, 50–60 cm. long, flabby, with their axes slender, more of less flattened, as thick as a pack-thread: they carry distichally and alternately 8–9 spikelets on each side; the secondary spathes are 7–8 cm. long: at first they completely envelope the spikelets, then they are split open along the ventral side, and spread out into a narrowly lanceolate, acute, auriculiform, membranous, dry, marcescent often lacerated limb, which is very finely striate on both surfaces and is covered externally with a very thin, partly deciduous, ferruginous scurf; spikelets inserted inside the tubular part of their respective spathes, and about one-third shorter than them, 4–5 cm. long, thickish while bearing the flowers (7–8 mm. broad); they have 4 series of 10–15 collateral assurgent and unilateral, very closely packed flowers, or which the two series in the centre are of female, and the outer ones of neuter flowers; spathels bracteiform, very approximate, concave, produced at one side into a triangular acute point; involucrophorum dimidiately cupular, flat, two-keeled and bidentate on the side next to the axis, embracing the base of the neuter flower to which it forms a small cupula; involucre cupular, often irregularly more or less lunately excavate and bidentate on the side of the neuter flower; areola of the neuter flower large, sharply edged and bidentate at the apex; spathels and involucre of a reddish brown colour, distinctly striately-veined and fugaciously and not copiously woolly in the young spikelets. *Female flowers* conical-ovoid; the calyx very shortly 3-toothed, strongly striately veined. *Neuter flowers* about as large as the females ones. *Fruit* . . . .

Habitat.—S. W. Sumatra at Benkulen (*Heyne* in Buitenzorg Herbarium). Native name "Rotan Ulur."

Observations.—*C. Ulur* is very closely related to *C. Semoi* and at first sight it seems hardly distinguishable from it, but on closer examination, it appears distinct by several characters, especially by the lacerated primary spathes, and by the far more elongate secondary spathes, which are one-third longer than their respective spikelets.

The specimens seen by me are rather incomplete, and consist of female spadices with young flowers and leaves of young plants. *C. Ulur* together with *C. Semoi* may be placed in a special division of group XV, characterised by the secondary spathes, which at first enwrap the spikelets, and then spread out and become auriculiform.

SUPPL. PLATE 76.—Calamus Ulur *Becc.* Portion of a sheathed stem with an entire female spadix in flower; portion of a sheathed stem and one leaf (wanting its terminal cirrus) from a young plant. From Heyne's type-specimen in the Buitenzorg Herbarium.

187*d*. CALAMUS PSEUDO-ULUR Becc. n. sp.

DESCRIPTION.—Scandent, rather slender. *Sheathed stem* 1·5–2 cm. in diameter. *Leaf-sheaths* strongly gibbous-plicate above, obliquely truncate at the mouths, armed sparsely with solitary, very unequal, elongate-triangular spines, often obliquely inserted, and more or less ascendent; the largest spines are 1–2 cm. long. and have a broad base which, at times, is 10–12 mm. broad, is more or less extended right and left and is considerably concave underneath; in the young shoots the spines are hairy-fringed on the margins, erect and appressed on the surface of the sheaths; at times the spines are few, or entirely wanting or are represented by some superficial or almost obsolete, very slender, scabridulous ridges, though occasionally broad spines and a few rudimentary ridges are present together; the surface of the sheaths is greenish, at first very thinly puberulous-furfuraceous, later glabrescent, dull and very finely striate longitudinally; in some of the specimens, which apparently are from an adult but not yet fertile plant a rudimentary flagellum (or rather an abortive spadix) springs laterally from near the mouth of the sheaths: it is very slender, flattened, usually smooth, yet prickly at times and 5–6 cm. long. *Ocrea* axillary, short, liguliform: it has the upper part and the margins membranous, later dry and deciduous. *Leaves* rather elongate, 80–90 cm. long in the pinniferous part, with 13–15 very inequidistant leaflets on each side, and terminating in a rather elongate cirrus; petiole, in leaves of adult plants, very short, 3–4 cm. long, plano-convex, smooth or sparingly spinous with acute edges; in leaves of younger plants the petiole is rather elongate, 15–20 cm. long, and except close to its base is plano-convex, has acute edges, and is more or less armed with minute prickles; the rachis is deeply and broadly grooved along the sides in its lower part, and has an acute, salient, smooth angle with slightly concave side faces on the upper surface: underneath it is convex and irregularly armed with one line or frequently with 3 lines of solitary claws; the cirrus is very densely set with small, very sharp, solitary (never digitate or half-whorled) claws. *Leaflets* irregularly aggregated on each side of the rachis into 5–6 distant groups usually of 2–4 leaflets (1–4 cm. apart); the leaflets are papyraceous, of a rather dull green and almost concolorous on both surfaces, are plicate-5–pluri-costulate, elongate-lanceolate, broadest about their middle, and thence taper almost equally downwards to an acute base and upwards and gradually to a finely acuminate and at the sides bristly tip; the costae are slender, sharp, and smooth on both surfaces: they are usually only five in number, but frequently several secondary costae are present (at times as many as 10–12), which are as strong as the primary ones; transverse veinlets very conspicuous and prominent on both surfaces; the lower surface is frequently very minutely scabrid; margins

very minutely spinulous; the intermediate leaflets are 25–30 cm. long, 3–4·5 cm. broad; those near the base are usually narrower but not shorter, those of the upper end somewhat smaller. Other parts unknown.

HABITAT.—N. W. Dutch Borneo in the Residency of Sambas at Sungei Sibow (*Hallier* No. 1194); at Amai Ambit (*Hallier* No. 3310); and at Liang-gagan (*Hallier* No. 2614). All numbers in the Buitenzorg Herbarium.

OBSERVATIONS.—Very closely related to the Sumatran *C. Ulur*, from which it differs in its smaller size, in its leaf-sheaths being less spinous, but especially in its distinctly pluricostulate leaflets. Of *C. pseudo-Ulur* I have seen only sterile specimens, and those of *C. Ulur* in flower examined by me are very incomplete; a rigorous comparison of the two is therefore impossible.

SUPPL. PTATE 77.—Calamus pseudo-Ulur *Becc.* Two portions of sheathed stem (observe a little below their mouths the rudiment of a flagellum or of a spadix), upper and intermediate parts of a leaf. (From Hallier's No. 2614 in Buitenzorg Herbarium.)

188*a*. CALAMUS LONGISPATHUS Ridley (*longispatha*), Mat. Fl. Mal. Penins. ii, 209.

DESCRIPTION.—Apparently of moderate size. *Leaf-sheaths* . . . *Leaves* rather large and elongate, subcirriferous, the rachis being furnished at its summit with a few distant, diminutive leaflets; petiole rather robust, 12 mm. broad, with the upper surface almost flat and dull, and the lower convex, polished and armed at the sides with rather robust solitary claws; the margins sharp and armed with very small, horizontal spines; the first portion of the rachis is grooved at the sides from the insertion of the lowest leaflet, and is almost rectangular in transverse section: on the lower surface it bears strong solitary claws at the sides but none on the central line: towards the end it is bifaced, with an acute smooth salient angle above, and is irregularly armed with robust, solitary or more or less approximate claws beneath. The *leaflets*, in the small portions of a leaf seen by me, are very inequidistant and remote, ensiform, gradually narrowing to an acute base, and from the middle upwards gradually acuminate towards the upper end, but more suddenly when nearing the extreme apex: they are papyraceous, rather rigid, almost glossy above, dull and slightly paler beneath, distinctly and rather sharply 3-costulate, and are also more or less distinctly and irregularly striate, especially on the lower surface, by several secondary nerves; all nerves are smooth on both surfaces; transverse veinlets very numerous, continuous and sharp on both surfaces; the margins are rather conspicuously thickened and minutely and remotely spinulous, the spinules becoming more approximate and longer at the sides of the apex; the largest leaflets seen by me (those a little above the base) are 55 cm. long and 25 mm. broad; those near the upper end are much shorter and slightly narrower; the uppermost are quite rudimentary. *Male spadix* . . . *Female spadix* is elongate and stiff, about 2 m. long in one specimen, ends in a slender, unarmed, rather short caudiculum, has a plano-convex, very acutely two-edged, 12 mm. broad, peduncular part, which gradually passes into the lowest spathe; this spathe is very long (45 cm.), rigid,

thinly coriaceous, flattish or slightly concave on the axial side and has two very sharp spinous keels (the prolongations of the peduncular part): it is split longitudinally on the back, ends in a short triangular point, and is sprinkled throughout with small bulbous prickles; the other primary spathes are also very elongate, but gradually less than the first, tubular, slightly enlarged above from a narrow, somewhat flattened, two-edged, unarmed axial part: they are sprinkled with small bulbous prickles, are more or less split longitudinally in their upper part, and terminate in a short triangular dorsally-keeled point; the partial inflorescences are few (5), distant, inserted inside the mouth of their respective spathes, spreading, arched, the lowest about 20 cm. long and branched at the base: the upper ones gradually smaller: all bear a few spikelets (3–5) on each side; secondary spathes tubular, infundibuliform, closely sheathing, obliquely truncate and ciliolate at their mouths and produced at one side to a triangular acute point; the spikelets have a thickish axial part and are inserted just at the mouths of their respective spathes with a distinct axillary callus; spathes briefly tubular-infundibuliform, truncate and ciliolate at the mouths; involucrophorum laterally adnate outside its own spathel at the base of the one above; it has a short annular limb and forms a short neck to the involucre which is orbicular and slightly concave; areola of the neuter flower lunate, sharply edged. *Fruiting perianth* conspicuous, pedicelliform, campanulate, 5 mm. long; the calyx has a flat callous base and is parted down to about the middle into 3 broad acute lobes; the segments of the corolla are nearly twice as long as the calyx, ovate, acute, usually split. *Fruit* fusiform, 18 mm. long including the perianth and 6–7 mm. broad (immature): it narrows equally towards both ends and gradually tapers above to a stout conical beak which is surmounted by 3 short thick recurved stigmas; scales arranged in 12 longitudinal series, slightly convex, not grooved along the centre, straw-yellow with an intramarginal blackish line, and somewhat produced into a triangular bluntish lighter point: the margins finely erose. *Seed* (immature) also fusiform and acute at both ends.

Habitat.—I consider as typical the specimens of *C. longispathus* forwarded to me by *Ridley* and bearing the No. 8777. They were collected in Selangor (15th mile, Pahang track) near Semangkok Pass.

Observations.—I am not sure that the specimens from the other localities mentioned by Ridley really belong to *C. longispathus*, which appears to me to be a fine and distinct species, having only, perhaps, a certain affinity with *C. conirostris*.

Ridley is inclined to consider the fusiform fruit of his No. 8777 as the young stage of the fruit of other specimens, which in his diagnosis is described as "large globose, shortly ! beaked, orange"; but although the fruit of No. 8777 is not perfectly mature, it has certainly almost attained its definitive form, and I do not think it possible that it can ever become globose. Mr. Ridley also quotes my authority [as to the peculiarity of the scales being "obscurely" channelled, but I do not recollect having seen till now the plant described above, and much less having given a description of it.

It is a very peculiar species for its subcirriferous leaves, elongate, non-cirriferous, caudiculate spadix and fusiform fruit, borne by a conspicuous campanulate fruiting perianth.

SUPPL. PLATE 78.—Calamus longispathus *Ridley*. An entire spadix with not entirely mature fruits; lower portion of a leaf, upper surface. From Ridley's No. 8777 in the Herbarium at Singapore.

CALAMUS TIMORENSIS Becc. n. sp.

DESCRIPTION.—Apparently scandent and rather slender. *Sheathed stem* 17 mm. in diameter. *Leaf-sheaths* very obliquely truncate at the mouths, slightly gibbous above, densely armed with very finely subulate, very narrowly and thinly laminar, unequal, dark-coloured, spreading, elastic, rather dull or at least not glossy spines, often approximate by their bases set in transverse irregular series; the larger spines are 3–4 cm. long and 1–2 mm. broad at their bases, others are smaller and almost capillaceous; the surface of the sheaths is more or less superficially but very closely stamped with the impressions left by the spines during the prefoliation and is dull and covered with a pulverulent darkish scurf in the interstices; the ligule is triangular, about 15 mm. long, and densely hairy-hispid. *Leaves* apparently cirriferous, but in the specimen seen by me their upper end was wanting; petiole almost obsolete (1–2 cm. long); rachis glabrescent, irregularly set throughout and on both surfaces with small prickles, somewhat flattened and 6–7 mm. broad in its basal part, irregularly convex and obsoletely grooved at the sides higher up. *Leaflets* few, sub-equidistant but very distantly set on each side of the rachis (7–9 cm. apart), inserted at a rather wide angle, rather thinly papyraceous, dull and almost equally green on both surfaces, lanceolate, tapering from the middle down to an acute base and upwards to an acuminate and at the sides bristly apex: they are finely but rather sharply 3-costulate, also at times sub-5-costulate: on the upper surface the 3 central costae are almost of equal strength and sprinkled with a few short bristles; the under surface is quite smooth; margins finely and appressedly ciliate-spinulous, especially at the apex; the intermediate leaflets are 23–24 cm. long and about 3 cm. broad: those near the base slightly smaller (20 cm. by 2–2·5 cm.).

HABITAT.—It was collected by Teijsmann in Timor (No. 10791 in Buitenzorg Herbarium).

OBSERVATIONS.—The material upon which C. *timorensis* is established is very scanty and incomplete, not even sufficient to recognize its position among its congeners, but I have given to it a name in consideration of its being the only *Calamus* certainly known as growing in Timor. Moreover, by the assistance of the plate the species may be easily recognized, as it possesses some characters which I have not found in any other *Calamus*. It is in fact distinguishable by its dull, dark, scurfy leaf-sheaths, densely armed with seriate, long, and very slender laminar spines, and by the leaves being almost without a petiolar part, by the rachis set with scattered prickles all round, and by the few, very remote, equidistant, lanceolate 3-sub-5-costulate leaflets.

SUPPL. PLATE 79.—Calamus timorensis *Becc.* The entire type specimen in the Buitenzorg Herbarium.

177*a*. CALAMUS KEYENSIS Becc. n. sp.

DESCRIPTION.—Apparently scandent and of moderate size. *Sheathed stem* . . . *Leaf-sheaths* . . . *Leaves* rather large: the one I have seen, wanting its basal part only, is 1·60 m. long, subcirriferous, the uppermost leaflets being gradually greatly reduced in size, till the ultimate ones are almost rudimentary; the rachis is robust, 1 cm. broad in its lowest part, covered with fugacious scanty greyish scurf: the upper surface is smooth throughout, flattish in its lower part, but higher up has a salient angle which is obtuse at first and finally acute; the lower surface of the rachis is slightly convex and powerfully armed with robust claws, which have light-coloured bases and black tips and are somewhat irregularly set, and usually ternate, at a nearly regular distance of about 3 cm.; the spaces however become less, and the claws gradually smaller towards the end. *Leaflets* equidistant, firmly papyraceous, rigid, green on both surfaces, lanceolate, tapering from below the middle down to an acute base and upwards rather briefly to a subulate bristly tip: they are plicate-pluricostulate and somewhat concavo-convex; the mid-costa is slender but acute on the upper surface and is usually furnished with a small spinule near the base, otherwise both surfaces are smooth; the side costae are very slender, 4–5 on each side, unequal and barely distinguishable from a few other secondary nerves; transverse veinlets very sharp and numerous; margins remotely and appressedly spinulous, the spinules being transformed into short blackish bristles at the apex; the middle leaflets are 6–7 cm. apart, 30–32 cm. long, 3·5–5 cm. broad; towards the end the leaflets become gradually smaller and more closely set, the ultimate ones being only 2–3 cm. long and 4–6 mm. broad. *Male spadix* . . . *Female spadix* apparently rather large (not seen entire): it has several gradually decreasing partial inflorescences, which form short and dense scorpioid panicles of which the largest of those seen by me is about 12 cm. long, and has 5–6 gradually decreasing, arched, very slender, scorpioid branchlets on each side, inserted a little above the mouths of their respective spathes; primary spathes . . .; secondary spathes tubular, very closely sheathing, fugaciously furfuraceous, later glabrous, finely striately veined, unarmed, truncate and naked at the mouths, prolonged at one side to an acuminate point; the lower branchlets are 4–5 cm. long and carry a very few subunilateral spikelets of which only those near the base carry 5–6 flowers on each side, the successive spikelets having fewer and fewer flowers, till finally the uppermost are reduced to a single flower; tertiary spathes narrowly tubular-infundibuliform, very closely sheathing, striately veined, prolonged at one side into a finely acuminate point; spathels similar to the tertiary spathes, but their apices subtend their respective flowers, which are suffulted by a distinct pedicelliform involucrophorum; the latter is obconic with a very slender neck, is on the whole 1–1·5 mm. long, kept spreading by a distinct axillary callus; involucre orbicular discoid, entire, flattish, slightly raised above the involucrophorum; areola of the neuter flower punctiform. *Fruit* spherical, pisiform, 7–7·5 mm. in diameter, very shortly and obtusely beaked; scales very small and numerous, squarrose, arranged in 24 longitudinal series, rhomboidal, the point obtuse, very slightly convex, not grooved along the centre, straw-coloured with narrow reddish-brown edges and very minutely fringed ciliate margins. *Seed* globose, 5 mm. in diameter, with an even (non-pitted) surface; chalazal fovea elliptical in the centre of the raphal

side. Albumen homogeneous. *Fruiting perianth* obconical, pedicelliform, about 2 mm. long; calyx cyathiform, 3-lobed; the corolla as long as the calyx, its segments smaller than the lobes of the calyx.

HABITAT.—The Great Key Island, where it was probably collected by *Jaheri.* No. 277 in the Buitenzorg Herbarium.

OBSERVATIONS.—Apparently related to *C. heteracanthus.* A very distinct species with its spherical. very small fruits, with numerous, very small, squarrose, non-grooved scales, and with a distinctly pedicelliform perianth, borne by a slender, very conspicuous, pedicelliform involucrophorum. It is also well characterized by the subcirriferous leaves, which have lanceolate, equidistant, pluricostulate leaflets.

SUPPL. PLATE 80.—Calamus keyensis *Becc.* Upper end and intermediate portion of a leaf; partial fruiting branch. From No. 277 in the Buitenzorg Herbarium.

CALAMUS OXYCARPUS Becc. n. sp.

DESCRIPTION.—Tufted, gregarious. *Stems* erect, about 2 m. high. *Leaves* about 2 m. long, said to be very spiny (Cávalerie); in the small portion of one seen by me, the rachis is bifaced above, slightly convex below, and shows traces of having been armed there with straight, elongate spines; the leaflets are in groups of 3 on each side of the rachis; are lanceolate, or suboblanceolate, 25–30 cm. long, 3·5–4 cm. broad, and gradually narrow from about the middle, downwards to an acute base, and upwards to an acuminate tip spinulous at the side; have 5 costulae; are of a rather firm téxture, dull green and quite bald on upper surfaces, but are whitish below, from a very thin, soft, adherent, cottony indumentum; moreover, they are furnished on that surface with very numerous, small, scattered, spinule-like hairs, of a uniform length of about 1 mm.; the margins are minutely, and rather closely, spinulous; transverse veinlets sharp on the upper surface, sinuous and much interrupted. *Male spadix*......*Female spadix* very slender, flagelliform, flaccid, over one meter in length in one (apparently not entire) specimen, very simple, bearing very few, distant, simple spikelets, and terminating in a very slender, unarmed, thread-like caudiculum; primary spathes elongate, narrow, at first tubular, but soon split and slashed longitudinally, unarmed, thin and dry in texture; the axial parts of the spadix are interposed between two spikelets, are as thick as a pack-thread, fugaciously woolly, and almost unarmed or furnished only with a few straggling, short, prickles; the spikelets are straight, erect, appressed to the main axis, relatively large, 10–12 cm. long (the uppermost shorter): at a first glance, the flowers seem to be arranged in 4 longitudinal series, for the neuter flowers accompanying the female ones are very conspicuous, at least this arrangement may be presumed from the large areola upon which they were inserted, as none were left in place on the specimen seen by me; spathels obliquely infundibuliform, thinly membranous, tomentose, produced at one side into a triangular, often lacerate point; involucre immersed within its own spathel, and with difficulty distinguishable from it, bilobed on the side next to the axis; involucre deep, calyciform; the areola of the neuter flower conspicuous and in union with the external side of the involucrophorum, thus forming a special calyciform involucrum to the neuter flower, slightly smaller than that of the female. *Female flowers* relatively large, 7 mm. long, inserted at a rather acute angle, elongate-ovoid; the calyx is of hard

texture, striately veined, campanulate, parted down to the middle into 3 triangular acuminate lobes; the corolla is one and a half times as long as the calyx, its segments are lanceolate acuminate, puberulous and striately veined externally; stamens sterile with very narrow filaments and elongate-sagittate anthers; ovary elongate, densely covered with fulvescent wool; stigmata thickish, triangular-acuminate, recurved. *Fruit* 3 cm. long, 11–13 mm. broad, elongate-ovoid, rather suddenly contracted in its upper fourth part to an elongate, narrowly conical point and terminating in a bluntish stigmatic apex; scales, possibly more numerous than in any other *Calamus*, arranged in 24 longitudinal series, flattish, not grooved along the centre, produced into a triangular point, yellow or reddish-yellow in their posticous part, and gradually passing into a shiny black at the point; the margins are very peculiarly and very densely rusty-tomentose all round. *Seed*, elongate, narrowing towards both ends, 18 mm. long, 7 mm. broad, very slightly broader at the base than above, covered by a dry (probably once fleshy) integument; chalazal fovea superficial, very elongate; when the integument is removed the surface of the seed is smooth; albumen equable; embryo basal.

HABITAT.—Central subtropical China. Discovered by the Rev. J. Cávalerie of the Catholic Mission of Chung-king at Piri-fa in the Koei-tcheou (Kwei-tschou). The fruits were gathered in the year 1903 (No. 1263), and the flowers in February 1905 (No. 2204).

OBSERVATIONS.—It is a most peculiar species, evidently related to *C. arborescens* and like that non-scandent, and with leaflets white underneath; it is however quite distinct from any other especially by its curious long, conically-produced fruit having numerous scales, fringed with a thick rusty tomentum.

SUPPL. PLATE 81.—Calamus oxycarpus *Becc.* Female spadix in flower, spikelet with mature fruits; portion of a leaf; seed cut longitudinally through the embryo. Cavalerie's entire specimen.

CALAMUS MOSZKOWSKIANUS Becc. n. sp.

DESCRIPTION.—Scandent, slender. *Sheathed-stem* 12—15 mm. in diameter. *Leaf-sheaths* very densely beset with isolated (non-confluent) capillary or subbristly, brown, unequal, spreading spines, 2—4 cm. long or less, resting on bulbous bases: only a small portion of the surface of the leaf-sheaths, near the mouth on each side of the base of the petiole, is smooth and bare of spines: the mouth is obliquely truncate and densely edged with the same kind of subbristly spines as the surface, the bristles extending also to the ocrea, especially to its margins. *Ocrea* elongate-liguliform, about 5 cm. long, of a rigid texture. *Leaves* short, 50 cm. long (in 2 specimens), non-cirriferous; petiole obsolete: the rachis rigid and relatively robust and thickish, powerfully armed with a line of approximate, relatively robust, single claws along the centre of dorsum and with another line of similar claws near each margin; on the upper surface, the rachis is smooth throughout, flattish near the base and with a salient angle above. *Leaflets* numerous, spreading or almost horizontal, closely set, and equidistant, or nearly so, on the lower part of the rachis more or less distinctly grouped towards the end: in any case the naked spaces of the rachis are very short, and in the group the leaflets are regularly set, about 1 cm. apart: they are narrowly lanceolate, somewhat tapering towards the base from below the middle, and not very long

acuminate above to an acute tip which is prolonged into a setaceous apex: they are thinly papyraceous, green, and almost glossy on both surfaces; have 3 slender costae bearing a few fine bristles on the upper surface; underneath the mid-costa only is bristly; transverse veinlets very numerous and sharp; the margins are smooth, except very near the apex where they are minutely bristly-ciliate; the intermediate leaflets are 16—18 cm. long, 13—18 mm. broad; those near the base are not much smaller, but from about the middle of the leaf upwards gradually decrease in size, the two terminal being the smallest, and very shortly united by their bases.

Male spadix flagelliform, very elongate (2·30m. in one specimen,) supradecompound, bearing 6 partial inflorescences, with a very slender main axis especially in its upper part, where it is thread-like, and closely armed with very minute claws, but yet furnished with diminutive partial inflorescences even to very near its extreme point; primary spathes tubular, all closely sheathing, very elongate and entire: the lowest slightly flattened, obliquely truncate and entire at the mouth, 7 mm. broad with acute spinulous edges; the upper spathes are very briefly produced at the apex into short obtuse or split auriculiform limbs, more or less armed with small claws; the partial inflorescences form rather dense, somewhat irregular panicles 20—25 cm. long; their main axis is very slender and sinuous, and carries several gradually-decreasing spikelets bearing branchlets; secondary spathes cylindrical, very closely sheathing, smooth; tertiary spathes elongate-infundibuliform; spikelets alternate and approximate on the branchlets, spreading, inserted outside the mouths of their respective spathes, very regularly pectinate, or strongly flattened with very regularly and closely-set, horizontal, bifarious contiguous flowers usually 15—20 mm. or at times 25 mm. long and 5 mm. broad; spathels, very approximate, concave, bracteiform, produced at one side into a triangular, deflexed acute point; involucre cupular, bidentate. *Male flowers* narrowly oblong, terete, small, a little over 2 mm. long, and about ·66 mm. broad; the calyx campanulate, 3-lobed; the corolla twice, or more, as long as the calyx, almost polished. *Female spadix*......*Fruit*.........

HABITAT.—The north coast of Dutch New Guinea on van Rees-Gebirge, at about 300 m. elevation. Collected by Dr. *Max Moszkowski*, January 1911. No. 478 in Berlin Herbarium.

OBSERVATIONS.—It is apparently related to the other New Guinea species having the leaf-sheaths prolonged into a very elongate ocrea. It is however distinguishable by the leaf-sheaths and ocrea being both armed with bristly spines: by the short leaves with numerous narrowly-lanceolate leaflets; and by the very elongate flagelliform spadix having small, flattened, pectinate spikelets bearing very small contiguous flowers.

SUPPL. PLATE 82.—Calamus Moszkowskianus *Becc.* Portion of the sheathed stem with the base of a leaf and insertion of the male spadix; upper end of a leaf; portion of the male spadix. It represents the type specimen in the Berlin Herbarium.

161*a*. CALAMUS KERRIANUS Becc. n. sp.

DESCRIPTION.—Scandent, slender. *Sheathed stem* about 15 mm. in diameter. *Leaf-sheaths* gibbous above, rather densely armed with very unequal spines, of which some are

rather large, often subseriate or irregularly confluent, deflexed, laminar, light coloured with spadiceous slender, very sharp points, 10–15 mm. long, 3–4 mm. long at their bases; the interstices between the large spines are occupied by other spines, considerably smaller, horizontal with a bulbous base, mixed with others still smaller, but ascendent; the surface of the young leaf-sheaths not occupied by the spines is thinly brownish-furfuraceous, and is more or less stamped with the impressions left upon it by the larger spines during the prefoliation. The mouth of the leaf-sheaths is obliquely truncate, dry, membraneous, and produced in to a short liguliform axillary ocrea. *Leaves* terminating in a slender cirrus armed with very sharp, half-whorled claws; the pinniferous part is about 1 m. long; the petiole 10 cm. long, 8 mm. broad (in one leaf), flat above, where sprinkled with small prickles, convex beneath, where armed with a line of solitary small claws; its margins are acute and more or less prickly; the rachis has the upper surface convex and sparsely prickly in its lowest portion, and is smooth with an acute salient angle in the remainder; its lower surface is armed with a line of solitary claws, and also with smaller claws on the margins. *Leaflets* not very numerous, 26 on the whole in one specimen, very conspicuously approximating in distant groups of 2—3 on each side of the rachis: they are oblong—subelliptical, or slightly larger above the middle than below, subcochleariform, or rather considerably concavo-convex, tapering below to an acute base, and shortly and rather suddenly contracted above to a short acute bristly tip: they are papyraceous, concolorous, green and dull on both surfaces; on the upper surface, however, they are occasionally marked with polished and shiny narrow bands, especially along the margins; they have 4—6 very slender costae, and are quite bare of bristles or spinules on both surfaces; transverse veinlets numerous, rather approximate and sharp; margins very minutely and appressedly spinulous; the intermediate leaflets 18—22 cm. long, 6—6·5 cm. broad; the upper ones gradually smaller. *Male spadix* lax, subflagelliform, but not cirriferous, terminating in a short, slender, unarmed caudiculum, about 1 m. long in one specimen, almost simply branched, the lowest partial inflorescence only bearing small secondary branchlets at its base; it has on each side 4—5 spikelet-bearing branches or partial inflorescences and carries several simple spikelets on its apical part; primary spathes elongate, tubular, slightly enlarged and not very tightly sheathing in their upper part, greenish, armed on the back with a few very small claws, obliquely truncate, smooth, or deciduously ciliolate at the mouth, which is produced at one side into a triangular acute or acuminate point; the lowest spathe about 10 cm. long, somewhat larger than the others, rather acutely keeled, spinous in their basal parts, otherwise almost smooth; partial inflorescences inserted at or above the mouth of their respective spathes, spreading and arched; the lowest is the largest, 20 cm. long, bears at its base 2 small secondary spikelet-bearing branchlets, and about 10 simple spikelets on each side; the other partial inflorescences are gradually shorter, and have fewer spikelets; secondary spathes greenish, smooth elongate–tubular, slightly infundibuliform, truncate and deciduously ciliate at the mouth, produced at one side into a triangular acute point; spikelets flattened, pectinate, spreading, inserted just at the mouth of their respective spathes; the largest, the lowest, are 2—2·5 cm. long and about 1 cm. broad when loaded with fully-developed flowers; spathels broadly concave, acute, very approximate, deflexed, greenish, striately veined; involucre cupular, bidentate on the side next to the axis. *Male flowers* greenish, in contact with one another, horizontal, elongate-oblong,

slightly narrowing above to a bluntish point, obsoletely trigonous, 5—6 mm. long, 1·5 mm. broad; the calyx tubular-cyathiform, broadly 3-toothed, striately veined; the corolla twice as long as the calyx, its segments lanceolate, acute, finely striately veined. *Female spadix.........*

HABITAT.—Siam: at Doi Sootep, 900 m. elev., collected by *A. F. G. Kerr*, 14 Jan. 1912 (No. 1618 B in Kew and Beccari Herbaria).

OBSERVATIONS.—Of this *Calamus* the male plant only is known, and this fact renders the validity of this species somewhat uncertain, because in the group to which it belongs there is *C. Doriaei* which is known only by its fruit, and apparently *C. Kerrianus* seems somewhat related to that species. In the leaves with elliptical pluricostulate, concavo-convex, distinctly grouped leaflets, it approaches some of the varieties of *C. latifolius*, but the armament of the leaf-sheaths of *C. Kerrianus* is peculiar: its lax, subflagelliform male spadix having small, very regular, flattened, comb-like spikelets, distichally disposed on its partial inflorescences, is also characteristic.

SUPPL. PLATE 83.—Calamus Kerrianus *Becc.* Portion of the sheathed stem with an entire male spadix; intermediate portion of a leaf. From Kerr's No. 1618 B in Herb. Beccari.

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B. S. Press—30-10-1913—3513J—239—E. J. H.

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B. S. Press—20-12-1913—2882J—235—E. J. H.